

DOCKET FILE
ORIGINAL

Communications Commission

FCC 94-80

Before the
Federal Communications Commission
Washington, D.C. 20554

ET Docket No. 93-7 ✓

In the Matter of

Implementation of Section 17
of the Cable Television
Consumer Protection and
Competition Act of 1992

Compatibility Between
Cable Systems and Consumer
Electronics Equipment

B. Tuner Overload	95
C. DPU Interference	99
D. Image Channel Interference	104
E. Conducted Emissions	107
F. Radiated Emissions	114
G. Input Selector Switch Isolation	119
H. Bypass Switch Attenuation	122
Equipment Authorization	125
Implementation of Rules for New Consumer Equipment	128
Standards for Cable Systems	132
Channelization	132
Future Technologies	136
Procedural Matters	145
APPENDIX A: Amendments to the Rules	
APPENDIX B: Parties Filing Comments and/or Reply Comments	

FIRST REPORT AND ORDER

Adopted: April 4, 1994;

Released: May 4, 1994

By the Commission:

Table of Contents

	Paragraph
Introduction	1
Background	7
Section 17 Provisions	8
The Compatibility Report	13
Discussion	17
Basic Approach for Achieving Compatibility	18
Decoder Interface Connector	34
Rules for Existing Equipment	43
Supplemental Equipment	43
Scrambling of Signals on the Basic Service Tier	49
Remote Controls	60
Consumer Education	64
Implementation of Rules for Existing Equipment	75
Rules for New Equipment	78
Cable Ready Consumer Equipment Standards	78
Definition of Cable Ready Equipment	78
Channel Tuning	85
Receiver Performance Standards	91
A. Adjacent Channel Interference	92

INTRODUCTION

1. By this action, the Commission is taking the first steps towards ensuring enhanced compatibility between consumer electronics equipment and cable systems. These regulations implement the statutory requirements set forth by Congress in Section 17 of the Cable Television Consumer Protection and Competition Act of 1992 (1992 Cable Act), enacted October 5, 1992.¹ The objective of this portion of the 1992 Cable Act is to ensure compatibility between cable systems and consumer TV receivers and video cassette recorders (VCRs), consistent with the need to prevent theft of cable service.

2. The new cable-consumer equipment compatibility regulations include measures that will assure improved compatibility between existing cable system and consumer TV equipment. They also include provisions for achieving more effective compatibility through new cable and consumer equipment. The specific provisions of these regulations are essentially the same as those proposed in the *Notice of Proposed Rule Making (Notice)* in this proceeding, with a number of modifications that address issues raised in the record.² The new rules for improving compatibility between existing cable system and consumer equipment require that cable operators:

- 1) refrain from scrambling program signals carried on the basic tier of service;
- 2) offer subscribers supplemental equipment to enable them to use the special features and functions of their TV equipment with cable service; this includes providing subscribers the option of having simultaneous access to all signals that do not need to be processed by a set-top device;

¹ See Cable Television Consumer Protection and Competition Act of 1992, Pub. L. No. 102-385, 106 Stat. 1460, (1992), §17. This proceeding is limited to issues involved in implementation of Section 17 of the 1992 Cable Act. We have addressed the

implementation of other portions of this new legislation in other proceedings.

² *Notice of Proposed Rule Making* in ET Docket No. 93-7, 8 FCC Rcd 8495 (1993).

3) provide a consumer education program to inform subscribers of potential compatibility problems and methods for resolving such problems; this includes notice that remote controls and supplemental equipment compatible with the set-top devices used by the cable system are available from third-party vendors; and

4) allow set-top devices that incorporate remote control capability to be operated with subscriber-owned remote controls or otherwise take no action that would prevent the use of such remote controls, including changing the infrared codes used to operate the remote control capabilities of the set-top devices they employ so as to adversely affect the operation of consumer-purchased remote controls.

The compatibility rules for new equipment provide technical standards for "cable ready" consumer TV equipment and require that both "cable ready" consumer TV equipment and cable systems use a standard cable channel plan.

3. We also conclude that more effective compatibility between consumer TV equipment and cable systems that use scrambling can be achieved through use of a standard interface connector, or "Decoder Interface," in "cable ready" consumer TV equipment and associated component descrambler/decoder devices to be provided by cable systems. Used together, the Decoder Interface and component descrambler/decoder devices can eliminate the need for use of a set-top cable box. However, based on indications that the cable and consumer electronics industries are close to agreement on a new Decoder Interface standard that will serve both existing analog cable operations and also incorporate flexibility to support new technologies and services, including digital cable service, we find that it would be appropriate to allow an additional period of time for the industries to complete their work on the new standard. We therefore will not act on the Decoder Interface standard and related issues now, but rather will allow cable operators, consumer electronics manufacturers and other relevant industry parties an additional 90 days to complete the new standard.³ After that period, we will develop rules establishing a standard for a Decoder Interface connector and requirements for its use.

4. As a policy matter, we also find that standards for cable digital transmissions are desirable. These standards will be needed to ensure that compatibility is maintained as new digital cable technologies and services are introduced. We are not, however, adopting technical standards or other rules in this area at this time, as developmental work on cable digital technologies and services has not reached a stage where it would be reasonable to attempt to specify such regulations. We will continue to monitor progress by the industries in this area and will initiate a separate action on these issues as is necessary to assure continuing compatibility in the future.

5. The actions we are taking today will allow consumers to utilize equipment offered by a variety of suppliers, including the cable system operator, in a competitive market. Thus, a number of manufacturers and retailers will be able to increase their participation in markets to which they

previously had limited access. Opening these markets to competitive equipment providers will give product developers and manufacturers, as well as cable system operators, the ability and incentives to introduce new products and to respond to consumer demand. In return, consumers will have greater access to technology with new features and functions. Most importantly, consumers will be assured that the equipment they buy will work with their cable system.

6. Open entry for equipment provision ensures that the equipment market remains competitive. In addition to open markets and incentives for innovation, another key component of competition is information. The new regulations ensure not only that the marketplace will be open and equipment options available to consumers, but that consumers will be informed about their choices. Competition could be stifled unless consumers are informed about their equipment options. By structuring the regulations to promote innovation and competition, we expect increased investment in new technology development and increased economic activity as consumers purchase the new, competitively priced equipment.

BACKGROUND

7. In the 1992 Cable Act, Congress recognized that there are a number of compatibility problems between cable service and consumer electronics equipment. These problems tend to limit or preclude the operation of premium features of consumer equipment and/or to affect the ability of consumer equipment to receive cable programming. For example, the use of set-top cable converter/descrambler devices typically hinders the operation of VCR features such as timed recording of sequential programs on different channels and recording one program while watching another. Set-top boxes also preclude the operation of special features of TV receivers, such as "Picture-in-Picture," that require simultaneous tuning of two channels.⁴ In addition, current cable system practices often disallow the use of customer-owned remote control devices, both those that are supplied with receivers and VCRs and universal remote control devices that can control both cable set-top devices and consumer equipment. There also appears to be confusion on the part of consumers about whether, and the extent to which, equipment is "cable ready" or "cable compatible." For example, current TV receivers and VCRs vary in their ability to tune the full range of channels offered by cable systems.

8. *Section 17 Provisions.* Section 17 of the 1992 Cable Act adds a new Section 624A to the Communications Act of 1934, that addresses compatibility between consumer electronics equipment and cable systems.⁵ In Section 624A(a), Congress makes the following findings with regard to this matter:

- new and recent models of TV receivers and VCRs often contain premium features and functions that are disabled or inhibited because of cable scrambling, encoding, or encryption and by the use of cable devices, such as converters and remote control units, needed to receive programming;

³ If the industry parties do not complete their work in the 90-day period, we will establish a standard using our own resources.

⁴ A complete discussion of the various compatibility problems is provided in the "Compatibility Report," *infra*.

⁵ Section 17 of the 1992 Cable Act, *supra*.

- Consumers will be less likely to purchase, and electronics manufacturers will be less likely to develop, manufacture, or offer for sale, TV receivers and VCRs with new and innovative features and functions, if these problems are allowed to persist; and,

- Cable operators should use technologies that will prevent signal thefts while permitting consumers to benefit from the features and functions contained in such receivers and VCRs.⁶

9. Section 624A(b) specifies that, within one year of the enactment of the legislation, the Commission, in consultation with representatives of the cable and consumer electronics industries, must report to Congress on means of assuring compatibility between TV sets, VCRs and cable systems, consistent with the need to prevent theft of cable service.⁷ This section also provides that within 180 days of that report, the Commission shall issue such regulations as are necessary to assure compatibility between consumer electronics equipment and cable systems.⁸ Section 624A(b) states that in issuing these rules, the Commission shall consider whether and, if so, under what circumstances to permit cable systems to scramble or encrypt signals or to restrict cable systems in the manner in which they scramble or encrypt signals. However, Section 624A(b) also provides that the Commission shall not limit the use of scrambling technology where it does not interfere with the functions of subscribers' TV receivers or VCRs.⁹

10. Section 624A(c) specifies that, in developing the rules required by Section 624A(b), the Commission is to consider:¹⁰

- The costs and benefits to consumers of imposing compatibility requirements on cable operators and TV manufacturers in a manner that, while providing effective protection against theft or unauthorized reception of cable service, will minimize interference with, or nullification of, the special functions of subscribers' TV receivers or VCRs, including functions that permit the subscriber to--

-- watch a program on one channel while simultaneously recording a program on another channel;

-- record two consecutive programs that appear on different channels; and,

-- use advanced television picture generation and display features, and;

- The need for cable operators to protect the integrity of the signals transmitted by the cable operator against theft or to protect such signals against unauthorized reception.

11. Section 624A(c) further specifies that the equipment compatibility regulations shall include, as are necessary:¹¹

- Technical requirements with which a TV receiver or VCR must comply in order to be sold as "cable compatible" or "cable ready";

- Requirements that cable operators offering channels whose reception requires a converter unit--

-- notify subscribers that they may not be able to use the special features of their TV receivers and VCRs;

-- to the extent technically and economically feasible, offer subscribers the option of receiving all other channels directly, without passing through the converter unit;

- Rules to promote the commercial availability, from cable operators and retail vendors that are not affiliated with cable systems, of converter units and remote control devices that are compatible with converter units;

- Requirements that cable operators who offer subscribers the option of renting a remote control unit--

-- Notify subscribers that they may purchase a remote control from any source that sells such devices;

-- Specify the types of remote control units that are compatible with the converter unit supplied by the cable operator; and,

- A prohibition that cable operators may not take any action that prevents or in any way disables its converter units from operating with commercially available remote controls.

12. Finally, Section 624A(d) requires the Commission to review periodically and, if necessary, modify the regulations issued pursuant to this section in light of actions taken in response to the regulations and to changes in cable systems, TV receivers, VCRs and related technology.¹²

13. *The Compatibility Report.* On January 14, 1993, the Commission issued a *Notice of Inquiry (NOI)* seeking information and comment on the various issues relating to compatibility.¹³ The Commission indicated that the information gathered under the *NOI* was to be used in preparing the report to Congress required under Section 17 and in formulating proposals for rules to implement the compatibility regulations required under this portion of the 1992 Cable Act.

⁶ Section 624A(a), Section 17 of the 1992 Cable Act, *supra*.

⁷ Section 624A(b)(1), Section 17 of the 1992 Cable Act, *supra*.

⁸ Under Part 76 of the Commission's current rules, cable systems are subject to technical standards that specify minimum performance with regard to the quality of NTSC (or similar format) video signals provided at subscriber terminals, 47 C.F.R. §§76.62 and .605; delivery of closed captioning information, 47 C.F.R. §76.606; and signal leakage, 47 C.F.R. §§76.601(e), .605, .609(h) and .610-.617. NTSC is the analog television system currently used in the United States. Portions of the above rules also specify requirements for monitoring and measuring technical performance and resolving any interference resulting from cable system operation. The Commission's rules currently do not address compatibility between cable systems and extended features of subscribers' TV sets, VCRs and related equipment.

⁹ Section 624A(b)(2), Section 17 of the 1992 Cable Act, *supra*.

¹⁰ Section 624A(c)(1), Section 17 of the 1992 Cable Act, *supra*.

¹¹ Section 624A(c)(2), Section 17 of the 1992 Cable Act, *supra*.

¹² See Section 624A(d), Section 17 of the 1992 Cable Act, *supra*.

¹³ See *Notice of Inquiry*, ET Docket No. 93-7, 8 FCC Rcd 725 (1993).

14. Subsequent to the *NOI*, representatives of the cable television and consumer electronics industries established the "Cable-Consumer Electronics Compatibility Advisory Group" (CAG) to address the various topics in the matter of cable equipment compatibility. This group submitted a number of proposals to address both short term and long term compatibility problems. Under the CAG plan, compatibility problems between cable systems and existing consumer equipment would be addressed through consumer education and supplemental equipment that provides simultaneous access to multiple channels of cable service. A key element of the CAG plan for more substantial long term improvement in compatibility is the implementation of a "Decoder Interface" connector, an updated version of the existing EIA/ANSI "multiport" connector.¹⁴ This feature would be incorporated in "cable ready" TV receivers and VCRs to enable use of component cable descrambler/decoders. The component descrambler/decoders would connect to consumer devices through the Decoder Interface connector and process signals *after* the consumer device's tuner. This would avoid the current problems caused by the use of set-top devices that disable features of consumer equipment related to tuning. The CAG plan further provided that cable systems that use scrambling would be required to provide component descrambler/decoders to subscribers that have Decoder Interface equipped receivers and VCRs. The CAG plan also specified that a standard cable television channel plan be used by both cable systems and "cable ready" consumer TV equipment.

15. On October 5, 1993, the Commission submitted to Congress its "Report to Congress on Means for Assuring Compatibility Between Cable Systems and Consumer Electronics Equipment" ("Compatibility Report").¹⁵ In the Compatibility Report, the Commission concluded that the most appropriate course of action for addressing the cable system/consumer electronics compatibility matter would be a three phase plan. The first phase of this plan would provide immediate relief for the existing base of consumer equipment. The second would require more substantial measures in terms of standards for new equipment by both the cable and consumer electronics industries towards achieving more effective compatibility in the near future. The final step would encourage the development of consumer equipment and cable technologies that are more fully compatible in the long term. Consistent with this general plan, the Commission made a number of recommendations for specific steps to improve compatibility. These steps reflect the requirements for regulations specified in Section 17 and also include many elements of the plan suggested by the CAG, including reliance on supplemental equipment and consumer education to address problems with existing equipment, the use of the Decoder Interface connector and component descrambler/decoders to achieve more effective compatibility with new equipment and a requirement that new and rebuilt cable systems

use a standard channelization plan. The Commission further indicated that these recommendations would form the basis for its proposals for compatibility regulations.

16. On November 10, 1993, the Commission adopted the *Notice* in this proceeding, proposing rules for ensuring compatibility between cable systems and consumer equipment that are consistent with the recommendations in the "Compatibility Report." Comments and/or replies responding to the *Notice* were submitted by 49 parties.¹⁶

DISCUSSION

17. Our goal in this proceeding is to assure compatibility between cable service and consumer electronics equipment so that cable subscribers can use the special features and functions of their TV sets and VCRs when receiving cable signals. Our compatibility rules must also allow for the needs and interests of cable operators in protecting their signals against theft or unauthorized use. We further believe it is important that these rules provide for and encourage competition in the market for equipment used by subscribers to receive cable service. Such equipment includes channel converters, remote control units and other customer premises equipment. The new regulatory program and rules set forth in the following sections are intended to reflect a balance of these considerations, while also minimizing the burdens they impose on consumers, cable operators and manufacturers of consumer electronics equipment.

Basic Approach for Achieving Compatibility

18. In the *Notice*, we proposed to employ the three-phase plan recommended in the "Compatibility Report" for achieving compatibility between cable systems and consumer electronics equipment. The first phase of this plan seeks to provide immediate relief for the existing base of equipment. In this first step, cable operators would be required to offer their subscribers supplemental equipment for resolving the specific compatibility problems addressed in Section 17, refrain from scrambling signals carried on the basic service tier, provide consumer education and allow the use of customer-owned remote controls. The second phase would specify measures as are necessary that relate to new equipment to be taken by both cable systems and consumer electronics manufacturers to achieve more effective compatibility in the near future. These measures would include new technical standards for "cable ready" consumer equipment, the use of Decoder Interface connectors and associated component descrambler/decoders and a standard cable channel plan for new "cable ready" consumer equipment and cable systems. The final step would be to develop standards for the next generation of cable and consumer electronics equipment. In this regard, we indicated that we intended to standardize the system used by the cable industry for digital transmissions. We recognized, however, that developmental work in this area is still in progress. We therefore requested suggestions for a

¹⁴ The Decoder Interface would be an extension of the "multiport" connector that was included in a few TV receiver models several years ago. The multiport connector generally did not achieve significant use, however. Additional description of the Decoder Interface connector and the associated component descrambler/decoder is provided in the "Compatibility Report," *infra*.

¹⁵ See "Report To Congress On Means Of Assuring Compatibility Between Cable Systems and Consumer Electronics Equipment," Federal Communications Commission, adopted October 5, 1993.

¹⁶ The parties filing comments and/or replies are listed in Appendix B.

regulatory plan that would complete the development of a digital cable standard in a manner that would allow for timely and efficient introduction of consumer products that could receive digital cable service.

19. In the *Notice*, we also indicated that while the above approach appears to be the most practical solution for resolving the major problems of compatibility between cable systems and the special functions of consumer electronics equipment, we nonetheless believe the most desirable solution is for cable systems to use technologies that provide all authorized signals "in the clear."¹⁷ We therefore stated that we intend to encourage the use and development of cable signal delivery methods, such as traps, interdiction, addressable filters and other clear channel delivery systems, that eliminate the need for any additional equipment on the subscriber's premises.

20. Most of the commenting parties generally concur with the basic approach of our proposal for achieving compatibility, although many disagree with, or suggest modifications to, specific elements of that plan.¹⁸ For example, the CAG submits that our proposals represent a milestone toward realization of the objectives of Section 17 and that it supports the overall thrust and most of the details of this plan. The CAG states that greater ease-of-use improvements and cost savings are achievable only after a longer period of time, as both cable and consumer equipment are redesigned, and that the advent of digital cable transmission methods provides an opportunity to "get it right." It also agrees that our proposals to rely on an updated Decoder Interface connector and associated descrambler/decoder units, conformance by both cable systems and "cable ready" consumer equipment with a standard channel plan and new tuner and shielding standards for "cable ready" consumer equipment will avoid the need for use of set-top boxes in a cost effective manner for both cable system operators and their subscribers. Many other parties representing the interests of cable operators, manufacturers of consumer electronics consumer and consumers present similar statements and/or express support for the position expressed by the CAG. These parties generally agree that, given the large embedded base of consumer television equipment, the goal of improving compatibility cannot be achieved in a single step or completed in an abbreviated period of time.

21. O.D. Page (Page) and the Titan Corporation (Titan) argue that rather than adopt the Decoder Interface approach, which would result in ownership of more descrambler/decoder units by cable operators, we should allow subscribers to purchase descrambling equipment from third parties, while allowing cable operators to maintain control over the conditional access functions of the devices. They contend that current encryption technology is sufficiently secure to effectively prevent "piracy" even when incorporated in consumer equipment. Titan states that cases where the security system might be compromised could be handled by including security circuitry on replaceable "smart cards." Page and Titan argue that this approach would avoid the current cable industry monopoly

on such equipment and allow the production of consumer equipment that would be more compatible with cable service.

22. A number of parties urge that we proceed cautiously in developing and applying standards for new equipment. These parties believe that rules adopted now to ensure compatibility may not provide the flexibility needed for development of future technologies, which will involve the increasing convergence of digital video, telecommunications, computing and other types of information processing. For example, General Instrument Corporation (GI), Greater Media, Inc. (Greater Media) and Tele-Communications, Inc. (TCI) argue that a rule requiring all cable services to be delivered through the Decoder Interface would stifle the introduction of innovative cable technologies and services. The American Telegraph and Telephone Company (AT&T) and Bell Atlantic submit that the proposed regulations regarding use of the Decoder Interface could inadvertently inhibit the development of competing video delivery service, such as video dialtone, and standards for future technologies. Bell Atlantic points out that the transmission parameters of the new Decoder Interface standard being developed by the CAG are markedly different from those of the Asymmetric Digital Subscriber Line (ADSL) technology it is deploying for a video dialtone trial. AT&T and the United States Telephone Association (USTA) submit that we should apply the rules adopted herein only to today's analog equipment. BellSouth Telecommunications, Inc. (BellSouth) asks that we clarify that the compatibility regulations being adopted herein apply only to cable systems and do not apply to local exchange carriers providing video dialtone services. In its reply comments, the National Cable Television Association (NCTA) disagrees with the concerns of those parties that argue the Decoder Interface standard might not be appropriate for use with distribution media other than cable or that it might impede the introduction of new services. NCTA states the Decoder Interface proposed by the CAG should be able to accommodate new technological developments without ever requiring the use of set-top boxes on TV receivers and VCRs equipped with Decoder Interfaces.

23. The New York City Department of Telecommunications and Energy (NYC) and the Lakes Region Cable Television Consortium (LRCTC), an organization of several communities in New Hampshire, support our intent to encourage use of cable security technologies that provide signals to subscribers "in the clear." NYC and LRCTC indicate that their constituents are experiencing the types of problems resulting from use of set-top devices that are discussed in Section 17 and the *Notice*. For example, LRCTC states that its constituents have been confused and frustrated by the local cable system's recently-initiated scrambling of satellite-delivered signals. Multichannel Communications Sciences, Inc. (MCSI) submits that we should take specific steps to encourage use of "in the clear" technologies. MCSI argues that the Decoder Interface standards development process is likely to be lengthy and that consumer equipment with Decoder Interface connectors will not be available before the year 2000. It believes we should only rely on the Decoder Interface for accommodating

¹⁷ With "in the clear" technologies, all of the signals a subscriber purchases are available simultaneously, so that multiple signals may be tuned, for viewing or recording, at the same time.

¹⁸ The commenting parties' requests for modification and/or clarification of specific aspects of our proposals are discussed in the sections which follow.

digital transmissions. MCSI therefore recommends that more substantial compatibility be achieved in two separate steps: the first would implement channel tuning and RF interface improvements; the second would implement a Decoder Interface for accommodating digital transmissions. To provide an incentive for cable operators to use "in the clear" technologies, it asks that we allow higher benchmark rates for tiered program services delivered "in the clear." In its reply comments, the Consumer Electronics Retailers Coalition agrees that specific incentives would be useful to promote the development and use of "in the clear" technologies.

24. On the other side, commenting parties representing cable interests argue that we should abandon our preference for "in the clear" service. For example, TCI states that "in the clear" technologies have shortcomings as cable security measures and that we should not influence cable operators to use such technologies in lieu of scrambling. The CAG similarly argues that while traps, interdiction, broadband scrambling and related techniques each may have certain virtues, they all have limitations and characteristics that prevent them from being a reasonable a mandatory solution to compatibility issues. TCI further argues that we should not provide a competitive advantage to technologies competing with scrambling. GI contends that our preference for clear channel technologies is contrary to the demonstrated virtues of scrambling.

25. Cablevision Systems Corporation (CVS) opposes the general approach of our proposals for improving compatibility. CVS contends that our short-term proposals regarding supplementary equipment and mandatory provision of basic tier signals "in the clear" threaten to compromise signal security, create further consumer confusion and reverse advances in set-top devices made to resolve interference, picture quality, channelization and signal leakage problems. Rather than the multiple provisions proposed in the *Notice*, CVS believes that it would be preferable to require only a consumer information and education program in the short term.

26. Several parties, including CVS, Continental Cablevision, Inc. (Continental) and GI argue that any requirements and standards that we adopt for cable should also be applied to other multichannel video programming providers, such as direct broadcast satellite service (DBS), TV receive-only (TVRO) satellite service, satellite master antenna TV systems (SMATVs) and video dialtone. These parties submit that similar problems of compatibility exist with respect to other video delivery media and are also concerned that the compatibility regulations for the cable industry could leave cable operators at a competitive disadvantage with respect to other video media. In its reply comments, DIRECTV, Inc. disagrees with these parties, arguing that subjecting other video media to the cable compatibility requirements would constrain the ability of such media to employ alternative video interfaces and digital delivery systems.

27. We find that the three-phase approach proposed in the *Notice* will provide the most efficient and effective means for achieving compatibility between cable systems and consumer electronics equipment.¹⁹ The provisions of the first phase of this program recognize the difficulties inherent in improving compatibility between existing cable system and consumer equipment that cannot be readily modified. The thrust of these provisions is to ensure that cable subscribers are aware of compatibility problems and to require cable operators to take a series of meaningful steps to minimize the effects of compatibility differences. Cable operators will be required to assist their subscribers in overcoming the most troublesome problems, particularly those involving the use of multiple tuning functions that are addressed in Section 17 of the 1992 Cable Act. The plan of the second phase is to take advantage of the opportunity for designing new equipment to achieve more effective compatibility. The final phase will seek to ensure compatibility between cable systems and consumer equipment in the transition to the next generation of cable technologies, while also attempting to allow maximum flexibility for new technologies and services to develop.²⁰

28. We believe the gradual nature of this regulatory program reasonably balances the statutory factors we are required to consider in prescribing these regulations.²¹ Our approach will minimize the burdens of achieving compatibility for both industry and consumers, while also bringing the benefits of cable compatibility to consumers by minimizing the interference to, or nullification of, the special functions of TV receivers and VCRs.²² We have also attempted to minimize the burdens of the specific provisions of this plan and to distribute those burdens across the cable operators, manufacturers of consumer electronics equipment and consumers. Moreover, with the exception of programming carried on the basic tier of service, the new rules will continue to allow cable operators to use their own discretion in choosing the method they use to protect their programming from theft.

29. We disagree with Page and Titan that we should require cable operators to allow consumers to own descrambling equipment and to purchase such equipment from third parties. While we are aware that there have been advancements in encryption technology, we also understand that it is most important to cable operators that they be able to control the means used to access their programming. Moreover, signal thieves have been notoriously successful at defeating security systems for video programming services. We therefore will not require cable systems to allow their subscribers to own descrambling equipment. We do, however, recognize that it is possible to separate access control functions from other functions that may be performed in conjunction with the use of cable service, such as display of menus and decompression of digital signals. As discussed in the next section, we support separation of these functions as a means for promoting competition in the market for equipment used to receive cable service.

¹⁹ We also conclude that this phased-in regulatory approach is consistent with the requirements of Section 17 that we, within 180 days after submission of the "Compatibility Report" to Congress, "issue such regulations as are necessary to assure such compatibility," and "review, and if necessary, modify the regulations issued pursuant to this section in light of any actions taken in response to such regulations and to reflect improve-

ments and changes in cable systems, television receivers, videocassette recorders and similar technology." Sections 624A(b)(1) and (d), Section 17 of the 1992 Cable Act, *supra*.

²⁰ The rules adopted herein are set forth in Appendix A.

²¹ Section 624A(c)(1), Section 17 of the 1992 Cable Act, *supra*.

²² *Id.*

30. We share the concerns of those parties who urge that we proceed cautiously in adopting compatibility rules and standards for new equipment, digital systems and other new technologies and services. While we expect that the Decoder Interface connector will be flexible enough to accommodate most, if not all, of the attributes of cable digital service, we also appreciate that any such standard could constitute a gateway that constrains the development of new technologies. Moreover, the potential for such a constraining effect is substantially greater in the current period, where there is rapid development of new communications technologies and services that are distinctly different from those available in the past. Further, as AT&T and Bell Atlantic observe, the development of cable digital services will also be accompanied by questions about the compatibility of those services with other media. In view of these considerations, we believe the best approach is to plan for compatibility with future technologies and services to the extent possible now, with the understanding that it may be necessary to accommodate new developments that may not be fully compatible with standards we adopt now. If new digital and other technologies have important features that are not compatible with the standards we adopt now, we will make appropriate changes in our rules to accommodate their operation. In this regard, we intend to initiate a separate proceeding, as discussed below, to consider digital standards for cable service. As part of that proceeding, we will ensure that new incompatibilities do not arise between the digital service provided by cable systems and the digital equipment used by consumers to receive that service.

31. We disagree with those parties who argue that we should not seek to promote the use of "in the clear" technologies. While scrambling provides a high degree of security for cable operators, it also is the greatest source of equipment compatibility problems for consumers. We are not convinced that it is not feasible to develop a security approach that provides comparable security at a cost effective price while delivering subscribers all authorized signals in the clear. We applaud the efforts of MCSI and others to develop and introduce "in the clear" security systems. While we are not mandating the use of any form of "in the clear" technologies, we will continue to pursue policies that will promote the development and use of such systems. MCSI's request that we allow higher benchmark rates for tiered cable services provided "in the clear" is beyond the scope of this proceeding.

32. We reject CVS's suggestion that we limit our first-phase rules for ensuring compatibility to requirements for consumer education and information. We believe that the additional compatibility measures we are requiring provide more effective compatibility and, contrary to CVS's suggestion, continue to provide signal protection. Thus, we conclude that CVS's approach would not effectively ensure that there is compatibility between cable service and con-

sumer electronics equipment, and therefore would not as effectively implement the thrust of Section 17 of the 1992 Cable Act as our approach.

33. In response to the issues raised by BellSouth, CVS, Continental and GI about application of the cable compatibility rules to other video media, we are clarifying that the rules adopted herein will apply only to operations by a cable system, as defined in Section 76.5(a) of our rules.²³ Application of these rules to other video media is beyond the scope of this proceeding. We will consider issues concerning compatibility among alternative services in the appropriate context, as they might arise.

Decoder Interface Connector

34. In the *Notice*, we proposed to require that "cable ready" equipment include a Decoder Interface connector that meets the specifications of the existing multiport standard, EIA/ANSI 563.²⁴ We also noted that the CAG, in conjunction with the Joint Engineering Committee (JEC) of the EIA and the NCTA was developing an updated version of this standard to provide a hybrid analog/digital Decoder Interface that would be able to be used for both present analog signals and new digital TV signals.²⁵ The new Decoder Interface standard is also being designed to accommodate further advances in video transmission systems and services. We therefore proposed to adopt this updated standard, as an alternative to the multiport standard, if it were available in sufficient time for us to obtain comment on it before we complete our decision in this matter. We also proposed to require cable system operators that do not use "in the clear" signal delivery technology to supply their subscribers with component descrambler/decoders to process scrambled and/or digital video service through the Decoder Interface and to provide service in a form that is compatible with a component descrambler/decoder. Consistent with our recommendations in the Compatibility Report, we further proposed to require cable operators to provide component descramblers to subscribers without a separate charge for the equipment or its installation.

35. The majority of the commenting parties support our proposal to promote fuller compatibility through use of a Decoder Interface connector and associated component descrambler/decoder devices. They also strongly recommend that we adopt the updated Decoder Interface standard being developed by the JEC, rather than the current EIA/ANSI 563 standard. The CAG indicates that while the JEC's efforts to develop a new standard are not yet complete, it has made substantial progress in that endeavor.²⁶ The commenting parties therefore urge that we invoke the substantial discretion accorded to the Commission by Section 17 and adopt rules regarding the Decoder Interface requirements after completion of the new standard.

36. In recommending this course of action, the CAG states that the cable and consumer electronics industries believe that the JEC's updated standard would be much

²³ 47 C.F.R. § 76.5(a).

²⁴ See The Electronics Industry Association/American National Standards Institute's "Standard Baseband (Audio/Video) Interface Between NTSC Television Receiving Devices and Peripheral Devices," EIA/ANSI-563-1990 (EIA/ANSI 563).

²⁵ These future digital video signals would include both compressed standard definition and advanced television signals.

²⁶ The CAG included a copy of the "Interim Report of the

JEC's Decoder Interface Subcommittee on EIA IS-105" that presents the current state of the work on developing the new Decoder Interface standard. This interim report states that the new EIA IS-105 standard will provide complete compatibility with all of today's analog scrambling systems and has also been designed to be extensible to future digital services. This document also indicates the work that remains to be completed.

more beneficial for cable subscribers than the existing EIA/ANSI 563 standard and that they are firmly committed to completing the development and implementation a new Decoder Interface connector.²⁷ GI, Greater Media and TCI point out that EIA/ANSI 563 is incompatible with certain analog scrambling methods, digital video compression and the numerous interactive media on the horizon. The Joint Cable Commenters and Zenith Electronics Corporation (Zenith) submit that the improvements in the new standard, particularly the ability to accommodate all current analog scrambling methods and to provide a solid transition path to digital transmissions, are worth the wait for the new standard to be completed. CVI notes that the updated standard will also support on-screen display and force tuning functions. The Interactive Media Association (IMA) believes that the new standard will provide a good foundation for the development of new products and services while insulating consumers from the costs and complexities of evolving technology. NCTA, in its reply comments, indicates that the design of the updated Decoder Interface will provide the necessary avenues for new services, whether transmitted in analog mode or modulated digital or baseband digital modes.²⁸

37. Several parties, including Circuit City Stores, Inc. (Circuit City), Mitsubishi Electronics of America (Mitsubishi) and News Datacom, Inc. (News Datacom) submit that the Decoder Interface standard should provide for separating conditional access technology, i.e., security measures, from other functions performed through the Decoder Interface connector. These parties state that this approach is needed to provide for a competitive market in equipment used to receive cable service. They are concerned that the Decoder Interface standard could otherwise allow cable operators to bundle into component descrambler/decoder units devices, and thereby achieve a monopoly on, circuitry for features other than security, such as decompression, program selection and menus. These parties state that separating conditional access technology from other functions in the Decoder Interface standard would allow processing circuitry for new features of cable service to be integrated into new TV receivers and VCRs or into new set-top or decoder/descrambler equipment that would be available on the open market. Mitsubishi observes that the JEC has made significant progress towards a standard for an inexpensive "conditional access card" that isolates all security elements into one removable medium and that this could be incorporated into the updated Decoder Interface standard. Circuit City and Mitsubishi urge that we advise the CAG to implement the conditional access card as part of the Decoder Interface standard.

38. Many parties also address our proposals with regard to cable operators' responsibilities to supply subscribers with component descrambler/decoders, to do so without separate charges and to provide service in a format that is compatible with these devices. On a related issue, MCSI requests that we clarify our policy with regard to charges by cable systems for descrambling equipment that may be

located either inside or outside of a subscriber's premises. MCSI believes that cable operators should be allowed to charge separately for this equipment, which it argues performs the same functions as set-top descramblers.

39. We concur with the commenting parties that the public interest would be better served by adopting an updated Decoder Interface standard. The introduction of this feature in new consumer TV equipment and its use with component descrambler/decoders will constitute a significant step toward achievement of more effective compatibility between cable systems and consumer electronics equipment at reasonable cost. The numerous improvements in the forthcoming standard, particularly its capabilities for serving all existing scrambling systems, for accommodating new cable technologies and services and for providing a migration path to digital cable service, make it a clear choice over the existing EIA/ANSI 563 standard. Moreover, as noted by the IMA, the improvements in the new standard are expected to provide a substantial buffer to consumers against new incompatibilities that typically arise from the differences in equipment cycles in the consumer electronics and cable industries.²⁹

40. We recognize that the JEC has been working diligently on the new standard and that considerable progress has been made relatively quickly in these efforts. We also note that the time period available for addressing the complex technical and design issues in this standard has been very short, and that additional time is needed to complete this work. Accordingly, we will establish a Decoder Interface standard and address all aspects of rules regarding its use, including consideration of whether we should not allow cable operators to charge separately for component descrambler/decoders and require them to provide service in a format that is compatible with these devices, pending completion of an acceptable updated standard. We will also address MCSI's request for clarification of our policy on separate charges for equipment that can be located either inside or outside a cable subscriber's premises after the completion of an acceptable Decoder Interface connector standard.

41. We wish to emphasize that we consider the Decoder Interface connector and associated component descrambler/decoders to be an important part of our equipment compatibility program and therefore are concerned that the new standard be completed as expeditiously as possible. We believe a period of 90 days from the publication of this decision should be sufficient for the JEC to complete its work on the Decoder Interface standard. We urge the JEC to continue in its efforts and to finalize the new Decoder Interface standard within this 90-day period. If the new standard is not available after that period, we will establish a standard using our own internal resources.

42. We agree with those commenting parties who argue that the Decoder Interface should provide the capability to separate signal access control functions from other functions served through the connector. This capability will allow non-security functions to be provided through new products offered by retail vendors or to be incorporated

²⁷ The CAG also indicates that the cost of including the Decoder Interface in consumer TV equipment will be relatively low.

²⁸ NCTA explains that the Decoder Interface is expected to include approximately 20 pins, plus both RF and IF connectors. It states that by designing the point of compatibility as the

juncture where the television receiver or VCR interface receives the pins of the companion component descrambler/decoder, virtually any service or distribution technology can be accommodated.

²⁹ Thus, we conclude that it is not necessary to adopt rules regarding a Decoder Interface connector standard at this time.

into TV receivers and VCRs, thereby promoting competition in the market for equipment used to receive cable service. We therefore are advising the parties developing the new standard that the Decoder Interface standard we adopt must allow access control functions to be separated from other functions. While our statutory mandate directs us to ensure compatibility between consumer electronics equipment and cable systems, we do not wish to accomplish that goal at the expense of impeding consumer access to competing video delivery systems, such as home satellite dish, Direct Broadcast Satellite and wireless cable. We therefore urge that representatives of those and other affected industries be included in the Decoder Interface standard deliberations.

Rules for Existing Equipment

43. *Supplemental Equipment*. In the *Notice*, we proposed to require cable systems that use scrambling to provide their subscribers with supplemental equipment, such as set-top devices with multiple descramblers and/or timers and by-pass switches, to enable the operation of extended features and functions of TV receivers and VCRs that make simultaneous use of multiple signals. This equipment would be provided upon the request of individual subscribers. We further proposed to require cable operators to provide their subscribers the option of receiving all signals whose reception does not require use of a converter directly at the subscriber's TV receiver or VCR, without passing through a set-top device. This capability could be provided through use of by-pass switches or similar equipment, or by avoiding the need for use of set-top devices altogether. We also proposed to allow cable systems to provide supplemental equipment for improving compatibility at the request of individual subscribers and to permit them to charge for this equipment and its installation in accordance with our rate regulations for customer premises equipment used to receive the basic service tier.³⁰

44. The commenting parties generally support the proposed requirements for provision of supplemental equipment by cable systems. The CAG and GI submit that, collectively, these measures will facilitate the use of advanced picture generation and display features in TV receivers, allow subscribers to watch one program while recording another and permit sequential recording of programs on different channels, albeit with some additional cost and wiring complications. The CAG indicates that the widespread availability of supplementary hardware will ameliorate many of the compatibility problems Section 17 seeks to address. TCI states that given the unsynchronized technology cycles of the cable and consumer electronics industries, these supplementary devices will always play an important role in achieving compatibility.

45. A number of the commenting parties suggest modifications to our proposals regarding supplemental equipment. To save consumers time and money, John Fitzgerald, a cable subscriber, suggests that the rules also provide that subscribers may pick-up the supplemental equipment from their cable system's operations center and install it themselves. The Joint Cable Commenters ask that the language relating to delivery of unscrambled programming "without

passing through the set-top device" be clarified, as many set-top devices have internal bypass switches. NYC recommends that we require that supplementary equipment provided by cable operators to improve compatibility include stereo outputs on baseband audio terminals. The Sacramento Metropolitan Cable Television Commission (SMCTC) recommends that these requirements be strengthened to specify that the "more consumer-friendly" set-top boxes have at least an 8-event/7 day programmability capability.

46. Parties representing cable interests generally favor our proposal to allow cable operators to charge for supplementary equipment in accordance with the provisions of our rate regulations. TCI, Time Warner Entertainment Company, L.P. (Time Warner) and others state that this approach will allow cable operators to recover all the cost of such equipment and also will distribute the cost to those who need the equipment. NYC also agrees that we should allow cable operators to charge for supplemental equipment in accordance with our rate regulations, but recommends that we not allow cable operators to charge for its installation. NYC states that prohibiting charges for installation would encourage cable operators to fully inform subscribers of installation options at the time of the initial installation. SMCTC submits that we should allow a one-time installation charge for supplementary hardware, but not allow separate ongoing monthly charges. CVS submits that we should not require cable operators to offer subscribers both multiple descramblers and bypass switches. It argues that this would create consumer confusion and contribute to signal leakage, low picture quality and other technical problems. CVS submits that cable operators should be allowed to determine the appropriate mix of technology for resolving compatibility problems. Greater Media requests that we clarify that dual descrambler devices would be available from cable operators, rather than from retailers.

47. We conclude that the supplemental equipment proposed in the *Notice* offers the means to achieve immediate relief for the compatibility problems between existing cable systems and consumer electronics equipment in cases where cable systems use scrambling technology and set-top boxes that do not deliver all authorized signals "in the clear." In such cases, devices such as by-pass switches and set-top devices that include multiple descramblers and/or timers that can be programmed to tune to alternative channels sequentially can, to a significant degree, provide cable subscribers with the ability to operate the types of special functions with their VCRs and TV receivers that are addressed in Section 17 of the 1992 Cable Act. We therefore are adopting our proposal to require cable operators that use scrambling systems to offer their subscribers supplemental equipment to enable the operation of extended features and functions of TV receivers and VCRs that make simultaneous use of multiple signals.³¹ We also conclude that compatibility problems resulting from use of set-top devices can be reduced if subscribers are able to receive "in the clear" all signals that need to be processed by the device. This capability can generally be provided through a by-pass switch, or as indicated by the Joint Cable Oper-

³⁰ See 47 C.F.R. § 76.923.

³¹ As discussed below, in the section addressing the consumer education program, cable operators will also be required to advise their subscribers that, except for hardware used only to

control signal access, e.g., set-top boxes with multiple descramblers, supplemental equipment for improving compatibility may also be obtained from retail outlets.

ators, through internal by-pass circuitry in a set-top box. We therefore are requiring cable operators to offer their subscribers the capability to receive "in the clear" all signals that do not need to be processed by descrambling or other special circuitry in a set-top device.

48. We are not specifying a particular "package" of supplemental hardware that must be provided by cable systems nor the performance characteristics of the features of such equipment. The amount and types of supplemental hardware needed to resolve compatibility problems will vary depending on a variety of factors, including the consumer electronics equipment used by individual cable subscribers, the types of compatibility problems subscribers desire to address, whether they desire special features such as stereo or multiple-day timing capability, and how much consumers are willing to pay for the improvements they want. In order to provide cable operators latitude to tailor supplemental hardware to the needs of individual subscribers, the rules only will identify the general types of supplemental hardware to be offered and the types of compatibility problems that are to be addressed through such hardware. We will simply require cable operators to undertake a good faith effort to provide the types of equipment needed by individual subscribers. While we encourage cable operators to allow subscribers to pick up supplemental equipment from the cable system's operations center, we are not requiring this practice. This is consistent with our existing policy that allows cable operators to determine their own installation practices. Inasmuch as the purpose of supplemental equipment is to improve individual subscribers' use of cable service, we believe the cost of this equipment and its installation should be the responsibility of those subscribers who request it. We therefore will allow cable operators to charge for this equipment and its installation in accordance with our rate regulations for customer premises equipment used to receive basic service. Subscribers may, of course, choose to use supplemental equipment obtained from retailers for resolving compatibility problems, rather than obtain that equipment from their cable system. As indicated below, cable operators will be required to notify their subscribers that supplemental equipment for improving compatibility may be obtained from retail outlets. In response to Greater Media's concern, these requirements do not require that cable system operators allow subscribers to use multiple descrambler/decoder equipment that might be obtained from retailers or other parties.

49. *Scrambling of Signals on the Basic Service Tier.* In the *Notice*, we proposed to prohibit cable systems from scrambling signals carried on the basic tier of cable service. This proposal was intended to ensure that consumers who have purchased TV receivers and VCRs capable of tuning basic service channels are able to continue to receive service on those channels without the need for a set-top device. We also observed that cable systems often include

additional channels on their basic tier beyond those required to be on the basic tier under our rules.³² We requested comment on whether such signals should be exempted from the prohibition on scrambling of signals on the basic tier.

50. The CAG, GI, NYC, Pacific Bell, SMCTC, Time Warner and others generally support our proposal to prohibit scrambling of signals on the basic tier. Several of these parties note that, as we observed in the *Notice*, in current practice the basic service tier is nearly always unscrambled. They state that this is because theft of basic service is less of a problem than is theft of other services, and that it is beneficial to allow subscribers to access basic tier channels without using a descrambling set-top box. Pacific Bell and John Fitzgerald point out that scrambling any basic tier signals necessitates that subscribers rent a set-top descrambler from the cable system to receive all of the signals purchased. Pacific Bell states that prohibition on scrambling of basic tier signals will avoid the need for this additional equipment and thereby reduce consumers' real cost to subscribe to basic only service. In joint reply comments, the Consumer Federation of America and the Home Recording Rights Coalition (CFA/HRRC) suggest that cable operators should not be allowed to scramble any signals on regulated tiers of service that were not scrambled prior to the enactment of the 1992 Cable Act.³³ They state that it is reasonable to presume that if a signal were not scrambled before the 1992 Cable Act, there is no need to scramble the signal now or later. CFA/HRRC submits that for exceptions to this rule, we should establish a procedure allowing for public comment, where an operator would have the burden of demonstrating that a significant security threat that did not exist previously now exists or that a new service offered as part of a regulated tier should not be offered in the clear.

51. Most of the commenting parties that support prohibiting the scrambling of basic tier signals also believe that a waiver procedure is needed to allow cable systems experiencing theft of service problems to scramble basic channels.³⁴ The CAG states that such a procedure should provide for expedited handling of waiver requests and that a more exacting burden of proof should apply to waivers involving mandatory basic tier signals, e.g., local broadcast signals or access channels for public, education, or government services, than waivers involving non-mandatory channels.³⁵

52. A number of commenting parties representing cable interests oppose our proposal to prohibit scrambling of signals carried on the basic service tier. These parties generally submit that scrambling of signals on the basic tier is not a problem because such scrambling is not a common practice. These parties further argue that in some cases scrambling of basic service is needed to protect against signal theft. Continental states that a prohibition of scrambling on the basic tier will discourage cable operators

³² Section 76.901(a) of our rules provides that the basic service tier shall, at a minimum, include all signals of domestic broadcast stations provided to any subscriber (except a signal secondarily transmitted by satellite carrier beyond the local service area of such station, regardless of how such signal is ultimately received by the cable system), any public, educational and governmental (PEG) programming required by the franchise to be carried on the basic tier and any additional video programming signals added to the basic tier by the cable operator. See 47 C.F.R. §76.901(a).

³³ Regulated tiers include the basic service tier and cable programming service tiers, as defined in Section 76.901(a) and (b) of our rules, 47 C.F.R. §§76.901(a) and (b).

³⁴ The CAG states that cable systems at increased risk of signal theft may include those for which demand is highly affected by seasonal considerations, those that have high subscriber turnover, and those that experience measurable loss of effectiveness in their existing security techniques.

³⁵ The signals required to be carried on the basic tier are specified in Section 76.901 of the rules, 47 C.F.R. §76.901(a).

from adding services to that tier. CVS states that where recurrent non-payment situations are common, scrambling also reduces costs by allowing the cable operator to manage service without a truck-roll to disconnect and reconnect service. CATA also is concerned that the use of compressed video could be viewed as scrambling and that the proposed rule could then preclude small systems with a limited number of channels from using compression technology.

53. Barden Cablevision (Barden) argues that a prohibition on scrambling signals on the basic tier would ignore serious exposure to theft for single tier cable operators. Barden suggests that, if we adopt the scrambling prohibition, we modify it for single tier cable systems to either delay its implementation until such time as new technologies are readily available to facilitate compatibility between signal scrambling and consumer equipment, or exempt such systems where they have already installed scrambling.

54. Many parties representing cable interests argue that, at a minimum, we should exempt from the scrambling prohibition all channels carried on the basic tier beyond those required to be carried there. Barden and the Joint Cable Commenters state that such an exemption would preserve cable operators' ability to use scrambling to protect programming that is susceptible to theft. Barden also states that since most cable operators do not scramble basic tier signals, permitting them to scramble signals beyond the required tier components would have little impact on the overall effectiveness of our program for improving equipment compatibility. Continental suggests that if we decide to prohibit scrambling on the basic tier, we should also grandfather existing systems that have historically scrambled basic signals as an anti-theft measure, and provide a waiver process for systems facing serious theft problems. NYC, Pacific Bell and SMCTC believe that the prohibition on scrambling of signals on the basic tier should apply to all signals carried on that tier. Pacific Bell argues that since the price of basic service includes the cost of any non-mandatory channels added to the basic tier, cable subscribers are entitled to receive those channels without the need to use additional equipment for which an additional fee is charged.

55. We find that our proposal to prohibit scrambling of signals carried on the basic tier is appropriate as a means to promote compatibility between cable service and consumer electronics equipment. We also conclude that the prohibition on scrambling of basic signals should include both signals carried on the basic tier and any other signals that cable operators may choose to add to that tier. This rule will significantly advance compatibility by ensuring that all subscribers are able to receive basic tier signals "in the clear" and that basic-only subscribers will not need set-top devices at all. This rule also will have minimal impact on the cable industry in view of the fact that most cable systems now generally do not scramble basic tier signals.

56. We recognize that cable operators may have a stronger interest in protecting "non-mandatory" signals carried on the basic tier than the required signals. However, the fact that cable operators generally do not scramble non-mandatory signals carried on the basic tier now is indicative of the fact that theft of these signals is not a major

problem and that the scrambling prohibition will not discourage cable operators from adding signals to the basic tier. On the other hand, as indicated by Pacific Bell and John Fitzgerald, routine scrambling of these signals would pose a problem for basic-only subscribers, because it would require them to rent a set-top descrambler and perhaps also to obtain supplemental equipment, at additional cost and inconvenience. Accordingly, we are prohibiting cable operators from scrambling any signals carried on the basic service tier.

57. We do, however, understand that there are instances where cable operators may need to scramble signals to prevent theft of service or to address other operating problems such as the billing situation indicated by CVS. To accommodate such cases, cable operators may seek a waiver of the scrambling prohibition. Cable operators requesting such waivers will be required to demonstrate either a substantial problem with theft of basic tier service or a strong need to scramble basic signals for other reasons. As recommended by CFA/HRRC, cable operators will also be required to notify subscribers of waiver requests. Specifically, a cable operator must notify subscribers by mail that it has filed a request for waiver of the scrambling prohibition with the Commission. The notice to subscribers must be mailed no later than thirty calendar days from the date the request waiver was filed with the Commission.³⁶ The notice shall state the following:

On (date of waiver request was filed with the Commission), (cable operator's name) filed with the Federal Communications Commission a request for waiver of the rule prohibiting scrambling of channels on the basic tier of service. 47 C.F.R. Section 76.630(a). The request for waiver states (a brief summary of the waiver request). A copy of the request for waiver is on file for public inspection at (the address of the cable operator's local place of business).

Individuals who wish to comment on this request for waiver should mail comments to the Federal Communications Commission by no later than 30 days from (the date the notification was mailed to subscribers). Those comments should be addressed to the: Federal Communications Commission, Cable Services Bureau, Washington, D.C. 20554, and should include the name of the cable operator to whom the comments are applicable. Individuals should also send a copy of their comments to (the cable operator at its local place of business).

A cable operator may file comments in reply to subscriber comments no later than 7 days from the date subscriber comments must be filed. In assessing the waiver request, the Commission will consider issues raised in the subscriber comments and the cable operator's response to such issues in light of the criteria indicated above in determining whether to grant a waiver.

58. Although we are not adopting CFA/HRRC's suggestion that cable operators not be allowed to scramble any signals carried on regulated tiers that were not scrambled prior to the enactment of the 1992 Cable Act, we agree

³⁶ Cable operators must inform the Commission in writing, as soon as possible, of the date on which they mail the notification

to subscribers in order to allow the Commission to calculate correctly the filing deadline for subscriber comments.

that such a policy merits further consideration. We agree with CFA/HRRC's position that it seems reasonable to presume that if a signal carried on a regulated tier was not scrambled before the 1992 Cable Act, there is no need to scramble that signal now or in the future. Moreover, as observed by Pacific Bell and John Fitzgerald, the routine scrambling of these signals also causes significant compatibility problems for subscribers by necessitating the use of set-top descramblers. However, we believe an expanded record on this issue will better aid us in our deliberations. Therefore, we intend to include consideration of this issue in the same upcoming Further Notice of Proposed Rule Making that will address the Decoder Interface standard and related issues.

59. In response to CATA's concern regarding compressed video carried on the basic tier, the Decoder Interface approach that we are pursuing should provide for processing of compressed video signals. We intend to investigate this matter further in our future proceeding on digital video transmission standards, as discussed below. We are not persuaded that our scrambling prohibition should be modified for single tier cable systems. Where such systems might experience signal theft problems they are free to re-tier as appropriate.

60. *Remote Controls.* In the *Notice*, we proposed to require cable operators that offer subscribers the option of renting remote control units to operate set-top devices to permit the operation of their set-top devices with such commercially available remote control units, and take no action that would prevent the use of such remote control units.³⁷

61. The commenting parties that address this issue support our proposals for regulation of cable system remote control practices as consistent with the provisions of Section 17. Greater Media states that cable operators may need to disable remote control functions either to respond to a request by a subscriber or to avoid conflicts between devices in cases where two separate descramblers are used. CFA/HRRC submits that we should also prohibit cable operators from changing the infrared codes they use for remote controls if the new infrared codes will adversely affect the operation of previously-compatible remote controls. CFA/HRRC states that, absent such a prohibition, new infrared codes could disable a remote control that was compatible when it was purchased, and consequently cable subscribers would be reluctant to purchase remote controls from retail outlets.

62. We are adopting a requirement that cable operators allow their set-top devices that incorporate remote control capability to be operated with subscriber-owned remote controls or otherwise take no action to prevent the use of such remote controls. This requirement is somewhat more encompassing than our proposal, which would only have applied this requirement to cable systems that rent remote control units. However, on reviewing Section 624(c)(2)(E) of Section 17 of the 1992 Cable Act, we find that the

statute mandates that this requirement apply to all cable systems.³⁸ We advise cable operators that this requirement obliges them to actively *enable* the remote control functions of set-top devices where those functions do not operate without a special activation procedure.³⁹ As an exception to this rule, we will permit cable operators to disable the remote control functions of a set-top device in cases where the subscriber so requests. Under this exception, a cable operator that needs to disable the remote control functions of a set-top box to resolve a problem, such as the conflict between two descramblers mentioned by Greater Media, could do so with the consent of the subscriber.

63. Our requirement that cable operators otherwise take no action to prevent the use of subscriber-owned remote controls also includes CFA/HRRC's suggestion that we prohibit cable operators from changing the infrared codes used to operate the remote control capabilities of the set-top devices they employ. This requirement will necessitate that the remote control capabilities of any replacement customer equipment provided to subscribers employ the same infrared codes for remote control that are used with the subscriber's existing set-top equipment. This will avoid the need for subscribers to replace remote control units they own if the cable operator changes their set-top box. We do not believe this will be a significant burden for cable operators, as they can simply chose replacement equipment that operates with the same infrared codes as their existing equipment.⁴⁰ This requirement will not prevent cable operators from using new equipment that includes additional infrared codes for new remote control functions that were not included in existing models of equipment.

64. *Consumer Education.* In the *Notice*, we proposed to require cable operators to provide a consumer education program on compatibility matters to their subscribers. This information would be provided to cable subscribers in writing at the time they first subscribe and at least once a year thereafter.⁴¹ As proposed, the consumer education program would include a written notification that, in cases where a set-top device is used to receive service, subscribers may not be able to use special features and functions of their TV receivers, including functions that allow the subscriber to:

- View a program on one channel while simultaneously recording a program on another channel;
- Record two or more consecutive programs that appear on different channels; and,
- Use advanced picture generation and display features such as "Picture-in-Picture," channel review and other functions that necessitate channel selection by the consumer device.

The proposed consumer education program would further require cable operators to inform subscribers that some models of TV receivers and VCRs may not be able to

³⁷ We also proposed to permit cable operators to disable the remote control functions of a subscriber's set-top device in cases where the subscriber so requests.

³⁸ Section 624A(c)(2)(E), Section 17 of the 1992 Cable Act, *supra*.

³⁹ We note that the remote control functions of many existing models of set-top devices do not operate unless they are activated by a code transmitted from the cable system headend.

⁴⁰ In quantity orders, cable operators will be able to specify the specific codes to be used in new equipment.

⁴¹ After the initiation of service, cable systems would be permitted to choose the time and means by which to meet the annual consumer information requirement. For example, cable systems could choose simply to include the yearly consumer information on compatibility in a mailing with one of their regular billings to subscribers.

receive all of the channels offered by the cable system when connected directly to the cable system. It would also briefly explain the types of channelization incompatibilities subscribers could encounter when connecting their equipment directly to the cable system and offer suggestions for resolving channelization problems. Such solutions could include the use of a set-top channel converter device that subscribers could obtain from either the cable operator or a third party retail vendor.

65. We also proposed to require cable operators that offer remote control capability with their set-top devices to include in their consumer education program a written notification that subscribers may purchase from other sources a remote control unit that is compatible with the set-top devices. Under this proposal, cable systems would be required to list the models of remote control units that are compatible with the set-top devices they employ and to provide a list of sources where those models can be obtained in the local area. This list would be required to be current as of no more than 60 days before the yearly mailing of consumer information.

66. The commenting parties generally support our proposal for a consumer information program. For example, the CAG believes the proposed consumer information requirements will satisfy the information requirements of Section 624A(c)(2)(B) and will generally assist cable subscribers in understanding compatibility problems they may encounter. It indicates that although these requirements will apply to the cable industry, the consumer electronics industry will assist in developing educational materials for meeting the new requirements.

67. The commenting parties also request modifications to some of the specific requirements of our proposal. CVS asks that we clarify that the requirement to inform subscribers of the availability of set-top converter devices from third party vendors applies to basic converters without descrambling capability and that cable operators do not have to advise their subscribers of the commercial availability of descrambling equipment, including addressable decoders. Greater Media notes that a subscriber's remote control equipment may no longer be functional if the cable system changes his/her converter unit. It requests that in such cases a cable operator's responsibility not extend beyond the need to caution subscribers that such situations may occur from time to time. NYC requests that the consumer education requirements be extended to encourage or require cable operators to produce and carry compatibility education programs, to provide such programs to governmental access channel operators and to refer their subscribers to educational information through announcements in their billing statements.

68. TCI requests that we specify that cable systems electing not to offer their subscribers the option of renting a remote control do not have to comply with the remote control provisions of the consumer education requirements. In this regard, TCI observes that pursuant to new Section 624A(c)(2)(E) of the Communications Act of 1934, as amended, cable systems will *not* be allowed to disable the remote control capability of their set-top devices. It observes that cable systems could provide remote control capability, and indeed most will have to because most models of set-top boxes incorporate that capability, and also choose not to rent remote controls.

69. The commenting parties universally argue that the proposed requirement for cable operators to list all of the specific models of commercially available remote controls

that are compatible with their set-top devices and specific vendors of those devices is too burdensome. Many parties state that with literally hundreds of models of remote controls on the market, it is simply not practical to expect that accurate lists of compatible remote controls can be compiled or that such lists would remain accurate for any length of time. They also point out that it would be difficult to identify merchants carrying compatible remote control units and to determine relevant market areas. NYC notes that in a city like New York, a list of retailers that carry compatible remotes would be extremely long and would be subject to constant revision. Media General Cable of Fairfax County, Inc. (Media General) argues that local retailers can adequately communicate the availability of their products to consumers themselves.

70. The commenting parties suggest a number of alternative approaches for informing cable subscribers about the availability of compatible remote controls that are intended to minimize the burden of this task. The CAG recommends that cable operators be required to provide information explaining the different types of remote controls that are compatible with its set-top boxes and to compile and distribute lists that show the names and telephone numbers of remote control manufacturers and/or marketers. It also recommends that cable operators be required to supply subscribers periodically with the manufacturers and model numbers of the set-top devices they supply. The CAG and Greater Media further state that a good faith omission of a particular manufacturer should not expose a cable operator to legal liability. CVI, Continental, Media General, SMCTC and TCI suggest that we require cable operators to inform subscribers of the manufacturers and model numbers of the equipment they employ and advise them that compatible remote controls may be available from retail suppliers. TCI also proposes that the mailing encourage subscribers to contact the cable operator to ask about the compatibility of a particular device they might be considering.

71. We continue to believe that a requirement for cable operators to provide their subscribers a consumer education program at regular intervals is necessary and desirable to inform subscribers of compatibility issues and solutions and to advise them of the availability of set-top converters and remote control units from third parties, as required by Section 17 of the 1992 Cable Act. While we find that our proposed plan for the consumer education program is generally appropriate for these purposes, the final requirements we are adopting include a number of modifications in response to the submissions of the commenting parties. Accordingly, we are adopting our proposed consumer education program with the modifications and clarifications indicated below.

72. First, in response to the concern expressed by CVS, we are clarifying that the requirement to advise subscribers of the availability of set-top devices from retailers applies only to basic converters without descrambling or other access control functions. This is consistent with our position, as discussed above, that we do not believe it is desirable to require cable operators to make their security technology available for ownership by the public. Consistent with the requirements for cable operators to offer subscribers supplemental equipment for improving compatibility, cable operators will also be required to advise their subscribers that supplemental equipment for improving compatibility may also be obtained from retail

outlets.⁴² In response to Greater Media's request regarding a caution to subscribers about changes in the operation of remote controls if the cable operator changes set-top boxes, we note that, as indicated above in paragraph 62, we are prohibiting cable operators from changing the infrared codes used to operate the remote control capabilities of the set-top devices they employ. Thus, subscribers will not need to be cautioned about loss of use of their remote controls in such cases.

73. We find that, except as discussed below, the basic structure and content of our proposed consumer education program provides an appropriate balance between the need to properly inform cable subscribers about matters of compatibility and the burden the requirements impose on cable operators. We therefore are not extending the consumer education requirements to include the additional elements suggested by NYC. In response to TCI's request, we are clarifying that cable systems that elect not to offer their subscribers the option of renting a remote control will still have to comply with the remote control provisions of the consumer education requirements. Although Section 17 only refers to systems that rent remote controls, we nonetheless conclude that the interests of ensuring compatibility necessitate that the consumer education provisions regarding remote controls apply to all cable systems that employ subscriber equipment that is capable of being remotely controlled. We also wish to clarify that the requirement for the consumer information program to be provided to subscribers annually does not necessitate that the information be provided to individual subscribers on the anniversary of the date they first subscribed to the service. This requirement may be satisfied through a once-a-year mailing to all subscribers.

74. We are persuaded that the proposed requirements for cable operators to list all of the models of commercially available remote control devices that are compatible with their set-top devices and vendors that carry those models would, in fact, be impractical and overly burdensome. We therefore are adopting a revised plan that will provide adequate information to cable subscribers about the availability of compatible remote control units while minimizing the burden on cable operators of providing that information. The revised plan is a composite of all the alternatives discussed above. Under this plan, cable operators that employ subscriber equipment that is capable of being remotely-controlled will be required to include in their consumer education program a written notification that subscribers may purchase from other sources a remote control unit that is compatible with the set-top devices. They will also be required to identify the models of set-top devices they provide to their subscribers and to include a representative list of the remote control units currently available from retailers that are compatible with the set-top devices they employ. Cable operators will be required to make a good faith effort in compiling the list of currently available compatible remote controls; they will not be held accountable for inadvertent omissions. We are not requiring cable operators to list local retailers that carry compatible remotes. Rather, we encourage cable operators and their industry associations to coordinate with the suppliers of their set-top devices and the consumer electronics industry to compile lists of compatible remotes. These lists

will be required to be current as of no more than six months before the yearly mailing of consumer information. Finally, cable operators will be required to encourage subscribers to contact the cable operator to ask whether a particular remote control unit would be compatible with the subscriber's set-top box.

75. *Implementation of Rules for Existing Equipment.* In the *Notice*, we indicated that it appears that the rules for improving compatibility between cable system and consumer equipment can be implemented relatively quickly. We therefore proposed to make these requirements effective six months after we adopt final rules for equipment compatibility.

76. The commenting parties generally agree that these rules can be implemented in the time period proposed in the *Notice*. The CAG and Time Warner also recommend that we permit scrambling of basic signals that was occurring as of December 1, 1993, when the *Notice* was released, to continue pending the adjudication of waiver requests filed in a timely manner. The CAG further states that an exception needs to be made regarding provision of dual-tuner set-top devices by cable systems. The CAG submits that some cable box manufacturers do not yet have such products available and that it may take an additional 12 months before this equipment can be expected to be generally available. It suggests allowing an 18-month period before requiring cable systems to provide dual-tuner set-top boxes.

77. We conclude that the rules for existing equipment generally can be implemented expeditiously, that is, within six months, without imposing substantial burdens on cable operators. These requirements can be met with existing models of supplemental equipment, minor reconfigurations of, or software changes to, existing cable facilities and preparation of relatively brief texts and lists of equipment to inform cable subscribers about compatibility problems and how they can be resolved. Accordingly, the compatibility rules for existing equipment will be effective October 31, 1994. We are, however, providing several exceptions to this schedule. First, we are making the prohibition on scrambling of signals that were not scrambled prior to the enactment of the 1992 Cable Act effective July 31, 1994. We believe that this approximately three month period is an adequate amount of time for cable systems to alter their operations or construction plans to comply with the scrambling prohibition. In accordance with the information provided by the CAG, we will also delay implementation of the requirement for cable operators to provide set-top devices with multiple tuners until October 31, 1995. We advise cable operators that the requirements for other items of supplemental equipment will become effective on the six-month schedule. We also find that it will not be difficult for cable systems to comply with the requirements to allow their set-top devices that incorporate remote control capability to be operated with subscriber-owned remote controls. The requirement for cable system operators to allow their set-top boxes to be operated with subscriber-owned remote controls therefore will become effective May 31, 1994.

⁴² This notification requirement will not apply to hardware used only to control signal access, e.g., set-top boxes with mul-

tiple descramblers.

Rules for New Equipment

"Cable Ready" Consumer Equipment Standards

78. *Definition of "Cable Ready" Equipment.* In the Notice, we proposed to require that all consumer electronics equipment marketed as "cable ready" or otherwise marketed as intended for connection directly to cable service comply with the new "cable ready" equipment standards.

79. The CAG, Sharp Electronics Corporation (Sharp) and Zenith submit that the proposed definition of "cable ready" equipment is too broad. In statements representative of their position, the CAG indicates that the inclusion of "equipment otherwise marketed as intended for connection directly to cable service" in the definition would preclude consumers from having access to products that are capable of being connected to cable service, but which are not claimed to be "cable ready" as defined in the rules. It argues that the consumer electronics industry should remain free to manufacture and market, and consumers should be free to purchase, products that have none, or only some, of the characteristics to be required of "cable ready" sets. Zenith states that TV equipment that can tune most or all of cable channels, but does not include the other features required under the "cable ready" standard, is needed to continue to serve millions of consumers with a low cost product. The CAG recommends that we simply apply the new standards to those products which are expressly claimed to be "cable ready" or for which the same claim is made using substantially the same language.

80. On the other side, Cox Cable Communications and Newhouse Broadcasting Corporation (Cox), the Joint Cable Commenters and TCI believe that we should require all TV receivers and VCRs that can tune cable channels to comply with the technical standards for "cable ready" equipment. This would prohibit the marketing of consumer TV equipment with an extended tuning range that does not conform to the "cable ready" requirements. These parties argue that the inclusion of tuning capability beyond the broadcast channels in a TV receiver or VCR is tantamount to implying that the device is meant for connection to cable service. As an alternative to prohibiting equipment that has an extended tuning range but does not fully comply with the "cable ready" standards, the Joint Cable Commenters suggest that we require such equipment be labeled to warn potential purchasers that it may not operate properly when connected directly to cable service.

81. TCI and Time Warner believe that we should adopt point-of-sale notification and labeling requirements for the consumer electronics industry to advise consumers of potential compatibility problems that may occur if a "non-cable-ready" TV set or VCR is connected directly to cable service. They state that consumer education by cable operators will do little good if the TV receiver or VCR experiencing a problem was purchased by a consumer who was not properly informed of possible problems at the point-of-sale. TCI therefore recommends that we require that, prior to purchase, consumers be notified that some features of a "non-cable-ready" TV or VCR may not work or may not be necessary if the unit is connected to a cable system.

and that they be encouraged to consult their local cable operator for further information. TCI also suggests that we require that "non-cable-ready" consumer TV equipment be labeled to indicate the tuning range of the device and to inform consumers that certain features of the device may not be compatible with some of the services they may choose to purchase from cable operators. It further proposes that we require manufacturers of third-party remote controls to list on a unit's packaging the cable set-top devices with which it is compatible.

82. We agree with the CAG, Sharp and Zenith that our proposed application of the "cable ready" equipment standards would be too broad. We do not believe it is desirable, from the standpoint of either consumers or manufacturers of consumer electronics equipment, to preclude marketing of consumer TV equipment that has some, but not all, of the characteristics of "cable ready" equipment. For example, a TV receiver that has the capability to tune some or all of the cable channels but is not equipped with a Decoder Interface connector or enhanced receiver performance features may be satisfactory for many consumers. In this regard, we observe that not all consumers are affected by equipment compatibility problems and that others may be satisfied with resolving such problems through use of supplemental equipment. Similarly, not all consumers will be affected by emissions ingress and egress problems as a result of connection of their TV equipment directly to cable service. In such cases, consumers should not have to bear the added cost of equipment that provides full compatibility when they do not need it. We therefore will apply the technical standards for "cable ready" consumer electronics equipment only to devices specifically marketed as "cable ready" or "cable compatible."⁴³

83. We nonetheless are concerned that simply limiting the applicability of the "cable ready" standards in this manner and allowing all other products that have varying features intended to enhance their suitability for use with cable service could lead to confusion for consumers about the extent to which the products that are available to them in the market are compatible with cable service. To differentiate "cable ready" products from other products with features intended for use with cable service, we are requiring that consumer TV receivers and VCRs that incorporate features intended to be used with cable service but do not fully comply with the "cable ready" standards be labeled with an advisory that appears on the device and on its packaging. This advisory shall indicate that the product does not fully comply with the FCC's requirements for cable compatible equipment. As a corollary, the new rules also provide that equipment that does not comply with the "cable ready" standards may not be marketed with terminology that describes the device as "cable ready" or "cable compatible," or that otherwise conveys the impression that the device is *fully* compatible with cable service.

84. We are not extending the labeling and advisory requirements to remote control units. These units are not subject to requirements that they have the capability to command cable set-top devices and therefore may not be intended for use with a cable set-top device. We also be-

⁴³ We consider the terms "cable ready" and "cable compatible" to be equivalent and interchangeable. Consistent with the provisions of Section 624A(c)(2) of Section 17 of the 1992 Cable Act,

supra, the new technical standards adopted herein will apply to consumer electronics equipment marketed as "cable ready" or "cable compatible."

lieve that consumer electronics manufacturers will have an incentive to advise consumers of which, if any, set-top devices their remote controls are able to command.

85. *Channel Tuning.* In the *Notice*, we proposed to require that "cable ready" TV receivers and VCRs have the capability to tune all cable channels over a frequency range of 54 MHz to 1 GHz in accordance with the cable channel identification plan specified in the new EIA IS-132 standard developed by the JEC.⁴⁴ We also requested comment on whether it might be desirable to provide a "migration plan" to full 1 GHz tuning capability that would first require cable channel tuning capability somewhat lower than 1 GHz, such as 750 MHz, and then later require full 1 GHz capability.

86. The commenting parties addressing this issue support the use of EIA IS-132 as the standard channel plan for cable service and the tuning standard for "cable ready" TV receivers and VCRs. They generally agree that use of this plan will minimize the need to use set-top converters for tuning purposes. These parties differ, however, with regard to their views on the upper frequency to which "cable ready" equipment should be required to tune. The CAG recommends that "cable ready" consumer equipment be required to tune to 800 MHz, rather than 1 GHz. In support of the CAG's position, Zenith states that a requirement to tune to frequencies higher than 800 MHz would be unnecessary with the vast majority of cable systems in view of the trends in technology towards digital compression, which reduces the need for cable systems to use higher frequencies. Zenith also submits that a higher minimum upper tuning requirement would add to the cost of consumer electronics equipment. It submits that the tuning range requirement could be increased in the future if appropriate. CVI recommends that "cable ready" equipment be required to tune frequencies up to 750 MHz and that devices with digital and/or HDTV capability be able to tune channels up to 1 GHz. CVS, Mitsubishi, NYC, SMCTC and TCI believe that all new TV receiver equipment should be capable of tuning up to 1 GHz to avoid the renewed use of set-top converters when cable systems are inevitably built to operate up to that frequency. Mitsubishi believes that no migration path to the higher frequency range is needed. NYC states that a migration plan would only serve to confuse consumers.

87. GI submits that it is possible that digital transmission channels might use a bandwidth larger or smaller than 6 MHz and that we therefore should apply the EIA IS-132 channel plan only to analog video signals. TCI submits that while it supports a 1 GHz tuning requirement, it believes the best solution would be to require "cable ready" TV receivers and VCRs to incorporate modular tuners. It states that adding modularity to consumer equipment would protect consumers from premature obsolescence caused by the unsynchronized cycles of the cable and consumer electronics industries.

88. Bell Atlantic submits that use of frequencies below 54 MHz is feasible for cable service and that use of these frequencies may be preferable for digital video services. It suggests that we extend the lower range of the channel tuning capability of consumer electronics equipment to include the 5 to 54 MHz frequency band.

89. We continue to believe that adoption of the EIA IS-132 channel plan as the standard cable television channel plan will further compatibility between cable systems and consumer TV receivers and VCRs. As noted by the commenting parties, adherence to this standard will minimize the need to use set-top converters for tuning purposes. This standard also provides channels across all frequencies from 54 MHz up to 1 GHz and beyond and is consistent with the channel plan currently used by most cable systems. We concur with the CAG and Zenith that 800 MHz seems adequate as the minimum required upper tuning frequency for cable channels. In this regard, we agree with Zenith that 800 MHz is an appropriate choice for this standard in light of expectations for the upper range of frequencies that will be used by cable systems and the fact that a higher tuning requirement would unnecessarily add to the cost of consumer TV sets and VCRs. In considering 800 MHz as the minimum upper tuning requirement, we also observe that currently all TV broadcast receivers are required by our rules to be capable of receiving all channels allocated to the television broadcast service. Under this requirement, TV receivers are required to tune up to and including UHF channel 69, or 800-806 MHz. Inasmuch as TV receivers normally incorporate a single tuner for both cable and broadcast channels and the appropriate upper range for cable is essentially the same as the existing broadcast tuning requirement, we believe it would be appropriate to adopt the minimum tuning range for broadcast channels as the upper cable channel tuning requirement for "cable ready" equipment. Accordingly, we will require "cable ready" TV receivers and VCRs to tune to cable channels specified by the EIA IS-132 standard up to a minimum frequency range of 806 MHz. We will, of course, monitor developments in this area and take appropriate action in the future to alter the minimum tuning range requirement for "cable ready" equipment if necessary.

90. New "cable ready" consumer TV equipment will not be required to use the EIA IS-132 channel plan for reception of digital signals. As discussed below, we will consider an appropriate channel plan for digital cable service in the context of our future proceeding on cable digital cable transmission standards. We also do not believe it is desirable to require that "cable ready" TV receivers and VCRs incorporate modular tuners. While manufacturers will have discretion to include modular tuners as features of new equipment, we do not find that there is sufficient likelihood that an alternative channel plan to EIA IS-132 will arise to warrant requiring modular tuners in "cable ready" consumer equipment. Finally, we see no indication that cable services will be provided on channels in the

⁴⁴ The new channel plan is an amended version of the former EIA/ANSI IS-6 channel plan. This new standard is known as the Electronic Industry Association's "Standard Cable Television Channel Identification Plan, IS-132, May 1994" (EIA IS-132). We note that EIA/ANSI IS-6 accommodates full 1 GHz cable operation and that the new, amended channel plan maintains the former channel allocations for frequencies up to 1002 MHz. The new EIA IS-132 channel plan specifies frequency slots and as-

signs each a number for frequencies up to 1002 MHz and specifies a methodology for creating additional channels at higher frequencies. For example, a 1 GHz system using the new plan, would operate between 54 and 1002 MHz and would have the potential for 158 active channels. The CAG points out that EIA IS-132 does not require cable systems to deliver, or TV equipment to tune, any particular number of channels.

frequency range 5 to 54 MHz. We therefore will not extend the tuning standard for "cable ready" equipment to this area of the spectrum.

91. *Receiver Performance Standards.* In the *Notice*, we proposed various technical performance standards for "cable ready" consumer electronics equipment. These proposals were designed both to ensure proper operation of "cable ready" TV receivers, VCRs, and other consumer TV equipment with cable service and to prevent such equipment from causing interference to cable systems. In particular, our proposals included technical standards to protect "cable ready" TV receivers and VCRs against adjacent channel interference, tuner overload and direct pick-up of undesired signals. We also proposed standards for consumer electronic device signals conducted onto the cable system, radiated emissions, input selector switch isolation and by-pass switch attenuation. The CAG submitted detailed comments on the proposed technical standards that include suggestions for several changes to the proposed standards and measurement procedures.⁴⁵ CAG indicates that the technical standards it recommends for "cable ready" equipment are the result of a consensus agreement among the consumer equipment manufacturers and cable system operators. We are according CAG's comments considerable weight since they generally appear to be based on sound engineering analysis and to represent an industry consensus. Each of the various elements of the new technical standards are discussed below.

92. *A. Adjacent Channel Interference.* To reduce interference from signals on adjacent channels, we proposed to require that "cable ready" equipment not exceed a criterion of "just perceptible" interference to the desired signal from an adjacent channel signal whose visual carrier level is 3 dB above the visual carrier level of the desired signal.⁴⁶ We also requested comments on alternate test methods that do not rely on subjective observations of the television display.

93. The CAG indicates that, although adjacent channel performance is a combined response to lower and upper adjacent visual, chroma, and aural signals, industry experience has shown that interference from the lower adjacent aural carrier predominates. CAG also notes that, in practice the aural carrier of TV signals carried on cable systems is generally between 10 and 17 dB below the visual carrier signal level. Therefore, it believes that a standard based on a single unmodulated interfering carrier located 1.5 MHz lower in frequency and 10 dB lower in signal level than the visual carrier of the desired NTSC channel is sufficient to achieve our goal of adequate adjacent channel performance. In addition, the CAG recommends that we evaluate compliance through objective measurements made at the TV receiver IF output port rather than subjective observations of "just perceptible" interference. Specifically, CAG submits that a 55 dB suppression ratio, as measured at the unfiltered IF output port of the television receiver, would be equivalent to "just perceptible" interference and therefore would be appropriate.

94. We find that CAG's statements and recommendations regarding the adjacent channel performance standard are technically sound. We agree with the CAG's position that measurement of lower adjacent channel interference will provide an adequate indication of the adjacent channel performance of a "cable ready" television receiver. Further, we find that the standard proposed by the CAG is generally equivalent to our proposal and will provide sufficient adjacent channel interference protection. We also observe that the CAG's proposed measurement method would be more accurate and reliable than our proposed method because it is based on objective, rather than subjective, tests. Objective testing would also be less burdensome for manufacturers, since these tests can be automated easily. Accordingly, we are adopting the standard and testing methods suggested by the CAG.

95. *B. Tuner Overload.* To avoid tuner overload, we proposed to require that the tuners of "cable ready" consumer devices suppress distortion products on any frequency in the desired channel at least 55 dB below the visual carrier.⁴⁷ We also invited recommendations for a measurement procedure. The CAG proposes a procedure for measuring tuner overload and, based on this procedure, recommends that we require 51 dB suppression rather than 55 dB. It further recommends that the standard apply only for signals up to 750 MHz.

96. The CAG's proposed test method calls for measuring the amplitude of spurious signals falling within the 6 MHz wide unfiltered IF relative to the amplitude of any tuned carrier. The CAG suggests that measurements be performed with a test signal that exposes the RF input of a "cable ready" television receiver to a comb of unmodulated carriers. The individual unmodulated carriers would have amplitudes of +15 dBmV and be located at all possible visual carrier frequencies in the standard plan delineated in the EIA IS-132 standard. The CAG states that the +15 dBmV amplitude for the unmodulated carriers corresponds to the maximum amplitude of signals carried on cable signals. It also states that the comb of CW signals is appropriate for this test due to the mixing that can occur with multiple signals carried simultaneously on cable systems. The CAG believes it would be appropriate to require 51 dB suppression of distortion products with this test procedure, rather than our proposed 55 dB standard, because the average power levels of normal NTSC television signals is 6 dB lower than the CW carriers used for the measurements.

97. The CAG believes that the upper limit of the comb test signal should be 750 MHz because digital, rather than analog signals, will likely be used in cable systems that operate above this frequency. It states that the signal strength of digital transmissions is likely to be lower than NTSC analog transmissions by 5-10 dB. It further submits that digital signals will be more benign because the visual effect is more like a slight increase in noise rather than a discernable beat pattern in the picture. CAG also believes

⁴⁵ The CAG asked Working Group II (WGII) of the JEC to examine tuner performance specifications and the specific tuner performance criteria proposed in the *Notice*. A copy of WGII's comments and recommendations was appended to CAG's comments. CAG states that the comments and recommendations of WGII represent a consensus of the both the cable television and consumer electronics industries.

⁴⁶ A 3 dB higher adjacent channel signal corresponds to the variation in adjacent channel signals permitted under Section 76.605(4)(i) of our rules, 47 C.F.R. §76.605(a)(4)(i).

⁴⁷ Tuner overload results from the presence of many strong signals that interact and degrade the performance of the receiver.

that if analog signals are used at these higher frequencies, they will be attenuated much more than lower frequency signals due to the differential loss in the drop cable.

98. We find that the test method suggested by the CAG is an adequate and appropriate means for measuring tuner overload performance. We are not persuaded, however, that the suppression level for distortion products should be 51 rather than 55 dB. The CAG's suggested test method initially provides for input test signals that are 5 dB lower than the maximum limit of the amplitude of individual visual carriers (+20 dBmV) for cable systems specified in EIA Draft Standard IS-23.⁴⁸ Accordingly, we are adopting our proposal that the tuners of "cable ready" consumer equipment suppress distortion on any frequency in the desired channel products at least 55 dB below the visual carrier. We generally accept CAG's argument that tuner overload need not be tested at higher frequencies. However, we will require testing up to 806 MHz, rather than CAG's proposal of 750 MHz, because this corresponds to the required tuning capability of "cable ready" TV receivers and VCRs.

99. *C. DPU Interference.* To address direct pick-up (DPU) interference, we proposed to require that "cable ready" equipment not exceed a criterion of "just perceptible" interference in the presence of a 100 mV/m field generated by a CW source. The CAG suggests an alternative standard that employs measurements of interfering signal levels at the TV receiver IF referenced to specific carrier-to-interferer ratios, rather than subjective observations of "just perceptible" interference. Under the CAG's proposed test method, the receiver under test would be exposed to an external ambient radio frequency field whose amplitude is 100 mV/m and whose frequency is 2.55 MHz above the visual carrier of the channel to which the receiver is tuned. Tests would be performed with the receiver tuned to each of six EIA IS-132 television channels (two each in the low VHF, high VHF and UHF broadcast band) whose individual RF levels are 0 dBmV. Susceptibility measurements would be made by rotating the unit under test 360 degrees until the maximum response in the unfiltered IF passband is obtained. The CAG recommends that with this measurement procedure, we require suppression level on each test channel, as measured at the unit's IF output terminals, to be at least 45 dB below the response of the desired channel, i.e., a 10 dB reduction from the -55 dB proposed reference level. It further recommends that we require that the average of the suppression obtained for all of the channels tested be at least 50 dB, i.e., a 5 dB reduction. At frequencies between 800 MHz and 1002 MHz, in the case of equipment designed to tune in that range, the CAG suggests that tests be performed on six EIA IS-132 channels spaced approximately equally throughout the band. It recommends that the required suppression in this range be at least 35 dB on each individual channel and at least 40 dB for the average suppression of all channels measured.

100. The CAG believes that its proposed standard and measurement criteria are consistent with our proposed performance criteria. In recommending requirements for suppression ratios that are less than 55 dB, the CAG submits

test data indicating that susceptibility is strongly dependent on receiver orientation. It observes that, in conditions of actual use, receivers will be oriented randomly with respect to external fields, so that the average susceptibility will certainly be less than the tested maximum. It also states that the 100 mV/m external ambient field was based on signals present outdoors and does not take into account the average attenuation effects of buildings and other structures.

101. CVI believes that it would be more appropriate to use 250 mV/m as the maximum external ambient field strength for measuring DPU performance. In support of this proposal, CVI submits field intensity data measured in five communities. It claims that these measurements, which were made outdoors, show that the field intensity was greater than 250 mV/m in 19 percent of the samples and greater than 100 mV/m in 85 percent of the samples. CVI acknowledges, however, that some additional signal attenuation will occur due to structural shielding. It further states that although none of its submitted data included measurements made on UHF stations, it believes that field intensities from UHF stations tend to be higher than VHF stations. CVI believes this evidence supports a 250 mV/m field intensity for the DPU performance standard. In its reply comments, Zenith states that protecting consumer TV equipment against DPU in the presence of 250 mV/m external ambient field would not be technically practicable and is beyond what is economically justifiable in light of any potential advantage for consumers. SMCTC concurs with our proposal for DPU above 54 MHz, but recommends the requirements include a 3 volts/m immunity standard below 30 MHz to protect against AM broadcast stations, Amateur Radio and Citizens Band stations which all could be in close proximity to cable subscriber.

102. We agree with the CAG that the direct measurement of DPU interference at the TV receiver IF is preferable to subjective measurements based on "just perceptible" interference. We further agree with the CAG that, given the directional variation in receiver DPU performance, it is appropriate to establish standards for both individual channel DPU performance and the average of DPU performance for all measured channels. We also find the less stringent performance standards suggested by the CAG are appropriate in light of the fact that signal levels outdoors can be expected to be attenuated by walls and other structural components at indoor locations. The average susceptibility of the receiver in the home will in all probability be less than that determined under the proposed test method.

103. While we recognize that ambient external fields may sometimes exceed 100 mV/m, as CVI indicates, we nonetheless agree with the CAG that 100 mV/m is the appropriate standard to specify for the level of the external ambient field. In this regard, we are concerned that a more stringent standard might result in significantly higher prices for "cable ready" equipment that would discourage consumers from purchasing these units. We also find that the level of protection that would be provided under the standard suggested by the CAG would be a significant

⁴⁸ See Electronic Industries Association "RF Interface Specifications for Television Receiving Devices and Cable Television Systems, EIA Draft Standard IS-23" (EIA IS-23). The specifications of this standard are used by the cable industry and consumer electronics manufacturers to provide an effective

interface between cable service and consumer electronics equipment that are intended for connection to cable service. EIA IS-23 provides that the maximum visual carrier level of individual signals carried on a cable system should be not more than +20 dBmV.

improvement over the current DPU performance of consumer TV receivers and VCRs. The 100 mV/m level for external ambient field strength provides an appropriate balance of the competing concerns of the equipment cost and DPU protection. We also recognize CVI's point that field intensities in the UHF broadcast band may be somewhat higher than VHF. However, UHF fields also suffer greater attenuation through walls and other structural components. We therefore are not adopting different standards for ambient fields on UHF frequencies. We also are not adopting SMCTC's proposal to extend the DPU standards adopted herein to frequencies below 54 MHz, as this area of the spectrum is not within the tuning range of receivers being considered in this proceeding. Accordingly, we are adopting standards to protect against DPU interference on "cable ready" consumer electronics equipment and associated test methods as suggested by the CAG. The standards we are adopting will require measurement of DPU performance of "cable ready" equipment on frequencies up to 806 MHz, in accordance with our decision to specify 806 MHz as the minimum upper tuning range for "cable ready" equipment.

104. *D. Image Channel Interference.* In the *Notice*, we indicated that it was our belief that consumer equipment that complies with the DPU ingress standard would also be less likely to experience interference from both cable and off-the-air signals on the "image frequencies," i.e., frequencies that are removed 14 and 15 channels from the desired channel. The CAG states that when conventional 45 MHz IF frequencies are used in receivers along with high-side local oscillator (LO) injection, the receiver will have a potential response to the 15th higher channel on the system regardless of the DPU shielding provided. The CAG further states that image channel response is primarily a function of the internal circuitry design of the receiver, not the external shielding efficiency, as both desired and image channels are received on the same cable. Thus, it believes that separate requirements are needed for image channel performance.

105. The CAG suggests that receivers whose conversion frequencies are such that a potential image frequency falls within the cable system bandwidth should be required to reject the image signal by at least 60 dB from 54 MHz up to and including 750 MHz. In this case, the CAG's recommended suppression is 5 dB more stringent than the 55 dB equivalent of "just perceptible" interference. The extra 5 dB is intended to provide for the variations in cable system signal levels that are permitted in a 1 GHz bandwidth system under Part 76 of our rules.⁴⁹ Although Part 76 allows a maximum variation of 17 dB in a 1 GHz system, the CAG contends that in a well-maintained cable system, the variation over approximately 90 MHz (15 channels) will be considerably less. From 750 MHz up to and including 1002 MHz, the CAG recommends a minimum of 50 dB rejection. The CAG's relaxed specification at higher frequencies reflects its previously stated position that these frequencies are likely to be used for low amplitude digital signals.

106. We agree with CAG's position that an image rejection performance standard is needed for consumer equipment sold as "cable-ready." In this regard, we are persuaded that DPU specifications will not prevent image problems in consumer equipment. We also agree that, in order to allow for variations in cable signal levels permitted under Part 76 of our rules, a standard that is 5 dB more stringent than the equivalent of "just perceptible" interference is justified for this standard. The CAG's recommendation for reducing the image channel suppression standard for frequencies above 750 MHz also appears reasonable in light of the expectation that signals on frequencies in this range will be of relatively lower amplitude. Further, to be consistent with our decision on the minimum upper tuning requirement for "cable ready" equipment, upper limit of the image rejection standard will be 806 MHz. It seems reasonable to extend this limit from 750 MHz up to the upper tuning range limit. Accordingly, we are requiring that "cable ready" equipment suppress image signals by at least 60 dB from 54 MHz up to and including 806 MHz.⁵⁰

107. *E. Conducted Emissions.* In the *Notice*, we proposed to require that the level of RF emissions conducted onto a cable system by a "cable ready" consumer device be no more than -37 dBmV, referenced to 75 ohms, over the frequency range 54 MHz to 1002 MHz. The CAG believes our proposed conducted emissions limit is too stringent. It argues that our proposal is based on worst case conditions that are not likely to occur and fails to take into account variations in the factors that cause conducted interference. For example, it notes that our proposed limit assumes that the cable subscriber is receiving the minimum signal level of 0 dB required under our rules. The CAG submits that in most cases the signal delivered to the subscriber is considerably stronger. It observes that we also assumed that the cable system provides the minimum isolation between subscriber drops required under the rules. It submits that in most cases greater isolation is provided. The CAG further notes that there is considerable variability in the levels and the frequencies at which internally generated emissions are produced in equipment. It states that this fact should be weighed against the low probability that other near-by cable subscribers will be tuned to a channel receiving the interfering emissions. The CAG therefore argues that it is likely that most conducted emissions from consumer TV equipment will be well below the proposed -37 dBmV limit. The CAG also claims that manufacturers will design their products with sufficient compliance margin to account for variations in performance across production units.

108. The CAG recommends that we adopt two different standards for conducted emissions: one for emissions caused by signals generated internally within the device and another for emissions caused by retransmission of signals introduced into the device from external sources. For conducted emissions caused by local oscillator emissions and other signals internally generated within the consumer's device, CAG proposes the following limits:

desired signal shall be an NTSC signal with visual carrier levels of 0 dBmV and +15 dBmV modulated with a 10 IRE flat field and an unmodulated aural carrier level that is 10 dB below the visual carrier level. Tests are to be conducted with the receiver tuned to ten evenly spaced channels specified in the EIA-542 channel plan.

⁴⁹ See 47 C.F.R. §76.605(a)(4)(ii).

⁵⁰ In testing for compliance with this standard, image rejection shall be the ratio of desired to undesired RF carriers measured within the IF passband of the receiver. The undesired signal shall be a CW carrier equal in amplitude to the desired channel visual carrier and located 90 MHz above the visual carrier frequency of the channel to which the receiver is tuned. The

From 54 MHz up to and including 300 MHz -26 dBmV

From 300 MHz up to and including 450 MHz -20 dBmV

From 450 MHz up to and including 1,002 MHz -15 dBmV

Devices would be required to comply with these standards on any frequency in the applicable ranges. Further, CAG proposes that in the band 450 MHz to 1002 MHz, in addition to allowing a -15 dBmV maximum level for any individual frequency, we require that the average of measurements made on six channels equally spaced in frequency be no greater than -20 dBmV. The CAG submits that its proposals for less stringent standards take the above factors into account. In addition, it states that the progressive relaxations in the standards with increasing frequency are based on the increased cable drop losses that occur at higher frequencies.

109. For conducted emissions caused by retransmission of external signals, the CAG recommends that we limit conducted signals on any frequency to less than -26 dBmV when the device is operated in an external ambient RF field whose frequency varies between 54 MHz and 1002 MHz and whose field strength is 100 mV/m. CAG states that the same considerations that underlie its proposal that we specify -26 dBmV as the standard for conducted emissions caused by internally generated signals also apply in the case of conducted emissions induced by external sources.

110. GI supports the CAG's proposal for conducted emissions standards. CVI agrees with the CAG that the proposed limit is more stringent than necessary for TV receivers and VCRs with double conversion tuners that generally have their local oscillator above the highest frequency the units are capable of tuning. However, for single conversion tuners, which typically have their local oscillator 45.75 MHz above the tuned channel, CVI supports the *Notice's* tighter standard of -37 dBmV. Greater Media and CVS, with support from the Joint Commenting Parties and SMCTC, argue that we should extend the frequency range of the conducted emissions standard down to 5 MHz. These parties state that cable systems are beginning to operate two-way transmission technologies that use frequencies between 5 MHz and 30 MHz for subscriber return signals which need protection from conducted emissions produced by subscriber equipment.

111. We agree with CAG that the worst case conditions that underlie the proposed conducted emissions standard are not typical of cable system operation and that the proposed standard therefore would be unnecessarily protective and too burdensome for consumer equipment manufacturers. We also concur with the CAG that less stringent limits on conducted emissions in accordance with its plan for internally generated emissions, as indicated above, would be appropriate to minimize interference from consumer equipment in light of the operating characteristics of a typical cable system and the fact that losses through cable drops increase with frequency, and therefore provide additional attenuation between subscribers. As losses through

drop cables will affect both internally generated and externally induced interference signals, we will apply the same standard for conducted emissions irrespective of whether the source of the conducted signal is internal or external.

112. Different test methods are needed for internal and external sources of conducted emissions. In this regard, we are specifying that measurements for conducted emissions caused by internal sources are to be made with the device operating in a shielded room. Since the RF ingress methods and sources will be the same as in the case of DPU interference, measurements for conducted emissions from external sources will be made when the device is operated in an external ambient RF field whose field strength is 100 mV/m, following the same test conditions to be used in measuring receiver DPU.

113. We disagree with CVI that it would be appropriate to apply different conducted emissions standards based on the type of frequency conversion employed in the tuner of a device. We recognize that a device with a double conversion tuner incorporating an IF outside the frequency range of cable system operation could be expected to produce lower levels of conducted emissions in the applicable ranges of the standards. However, if such a device were, in fact, to generate high levels of conducted emissions, whatever their source, those emissions would have the potential to cause the same harm to other subscribers of the cable system as emissions from a device with a standard tuner. We also are not persuaded that we should extend the applicability of the conducted emissions standard to frequencies below 54 MHz, as suggested by Media General and CVS. These parties have not provided any information showing that there is a real risk of interference to cable system operation from conducted emissions in this frequency range. It is not likely that conducted emissions from consumer equipment will be strong enough to interfere with subscriber return signals that are intended to reach the cable system headend. In addition, the standards we are adopting address an entirely different interference scenario, *i.e.*, interference from one subscriber to another, not interference from a subscriber to cable return transmission signals. Accordingly, we will not adopt a limit on conducted emissions below 54 MHz.

114. *F. Radiated Emissions.* In the *Notice*, we proposed to require that "cable ready" units be tested to comply with the existing Part 15 limits on radiated emissions from unintentional radiators when connected to cable service.⁵¹ We proposed to require that compliance be demonstrated with input signals on six cable channels distributed evenly over the frequency range of 54 MHz to 1002 MHz and with the signal level of the input cable signal varied from 0 to 25 dBmV. We asked for comment as to whether such tests should be required over the entire range from 0 to 25 dBmV, or whether testing only at the two extremes would suffice. We also proposed to apply these performance and testing requirements to cable system terminal devices (CSTDs).⁵²

⁵¹ The Part 15 emissions limits that apply to consumer TV equipment are set forth in Section 15.109(a) of the rules. See 47 C.F.R. §15.109(a). The tests for radiated emissions when connected to a cable signal would be in addition to the existing tests required for radiated emissions when connected to an antenna input. See 47 C.F.R. §15.31(n).

⁵² Cable system terminal devices are TV interface devices that serve, as their primary function, to connect a cable system to a TV receiver or other subscriber premise equipment. See 47 C.F.R. §15.3. These devices are subject to the general Part 15 emissions limits for unintentional radiators, as set forth in Section 15.109(a) of the rules. See 47 C.F.R. §15.109(a).

115. As an alternative to our proposed use of the Part 15 radiated emissions limits, the CAG proposes that we employ the more stringent radiated emissions limits for cable systems specified in Part 76 of our rules as the standard for re-radiated emissions of cable signals by "cable ready" equipment.⁵³ It contends that signal leakages, whether from the cable plant or from receivers connected to that plant, are required to be within the limits set in Part 76, rather than Part 15. CAG also recommends a receiver input cable signal level of +15 dBmV for compliance testing. This corresponds to the maximum input level provided to subscriber equipment by typical cable systems. The CAG further suggests that, where a device is furnished with interconnecting cables, radiated emissions be measured with those cables attached in a normal configuration.

116. The Joint Cable Commenters support CAG's contention that Part 76 radiated emissions limits should apply to consumer equipment connected to a cable system. They also agree that measurements of radiated emissions should be made with an input signal level of +15 dBmV. SMCTC believes that our proposal to require testing on only six evenly spaced channels for radiated emissions testing is inadequate for determining compliance. It proposes that testing be conducted using a full complement of 158 potential cable channels.

117. While we agree with the CAG that application of the Part 76 emission limits to "cable ready" receivers may provide slightly greater assurance than the Part 15 limits that "cable ready" TV equipment does not cause harmful interference, we are not convinced that such a standard is necessary. As we observed in our previous decision to apply the Part 15 radiated emissions standards to CSTDs, the emissions characteristics of consumer TV receiving devices differ distinctly from those of a cable system distribution plant.⁵⁴ The Part 76 emission limits were designed to apply to open air cable installations where radiated emissions would not be attenuated significantly by surrounding structures. On the other hand, radiation from television receiving equipment, which are point sources, is subject to propagation losses that are greater than the cable system as a whole. Emissions by TV receiving equipment are also attenuated by the structure within which it is located. We note that CSTDs, which connect to cable systems and are currently allowed the higher emission levels of Part 15, have not been a threat to the operation of cable systems. We therefore find that it would be unnecessarily burdensome and costly to require manufacturers of "cable ready" TV receiving equipment to comply with tighter emission standards when their devices pose no greater threat than cable set-top boxes and other CSTDs. Accordingly, we are adopting our proposal to apply the radiated emission limits of Section 15.109(a) to "cable ready" consumer TV equipment.

118. We also find that a single input cable signal level of +15 dBmV, as suggested by the CAG, is appropriate for testing "cable ready" equipment for compliance with the radiated emissions standard, rather than a range of 0 dBmV

to +25 dBmV. We therefore will require that a +15 dBmV NTSC signal be used as the input cable signal in testing for compliance with this standard. We are not adopting SMCTC's suggestion that we require radiated emissions tests to be performed with the device tuned to each of the cable channels the device is capable of tuning. Such testing would be burdensome for manufacturers and SMCTC has not provided any technical information or other grounds that would indicate the need for performing the test with a full complement of 158 potential cable channels. We therefore will require that compliance be demonstrated with input signals on six EIA IS-132 cable channels distributed evenly over the frequency range of 54 MHz to 1002 MHz.

119. *G. Input Selector Switch Isolation.* RF emissions can also leak from and/or enter into cable systems through input selector switches (also called A/B switches) used to alternate between service from a cable system, an antenna for reception of broadcast signals, or other equipment such as a VCR or videodisc player, if the switches do not provide adequate isolation between their various ports. Under the existing Part 15 rules, input selector switches used to alternate between cable and antenna service that are included in TV receivers and TV interface devices, such as VCRs and CSTDs, are required to comply with isolation standards.⁵⁵ In the *Notice*, we proposed to clarify that the input selector switch isolation standards would apply to all transfer switches used to alternate between a cable service and other inputs, including stand-alone units that are not part of a "cable ready" TV receiver or a TV interface device. We also noted that the input selector switch isolation rules currently are specified only for frequencies up to 550 MHz. In considering this issue, we recognized that it becomes more difficult to achieve high levels of isolation at higher frequencies and that the amount of isolation needed also decreases with increasing frequency. We therefore requested comment on the appropriate standard or standards to specify for the frequency range from 550 MHz to 1002 MHz to conform with cable service that might use channels up to this frequency range.

120. The CAG recommends that we only extend the isolation requirements for input selector switches used with cable service up to 800 MHz. It submits that switch isolation can be expected to deteriorate gradually above 800 MHz. The CAG further observes that TV antennas connected to an input selector switch are inefficient radiators above 800 MHz. It therefore suggests that we require input selector switches used with cable service to provide 55 dB isolation between ports in the frequency range 550-800 MHz. CVS supports extending the Part 15 isolation requirements to frequencies up to 1 GHz. NYC also supports extending the Part 15 isolation standards for input selector switches up to 1 GHz and applying these requirements to all selector switches, including stand-alone units. SMCTC believes that the current requirement for 60 dB should be extended from 550 MHz up to 1002 MHz.

⁵³ The radiated emissions standards for cable systems are set forth in Section 76.605(a)(12). These standards provide that radiated emissions on frequencies less than 54 MHz and over 316 MHz must not exceed 15 mV/m at 30 meters and that radiated emissions on frequencies over 54 MHz up to and including 216 MHz must not exceed 20 mV/m at 3 meters. See 47 C.F.R. §76.605(a)(12).

⁵⁴ See *Report and Order*, GEN Docket No. 85-301, 2 FCC Rcd 3304 (1987).

⁵⁵ See 47 C.F.R. §§15.115(c) and 15.117(h). These sections currently provide that transfer switches must provide 80 dB of isolation for signals in the frequency range 54 to 216 MHz and 60 dB for signals at frequencies from 216 to 550 MHz.

121. We continue to believe that it is necessary to extend the isolation requirements for input selector switches used with cable service to higher frequencies and to apply these requirements to all such switches, including stand-alone units. We also concur with the CAG that 55 dB isolation will provide adequate protection against leakage of higher frequency cable signals. We further recognize the difficulties inherent in designing economical switches that can provide a high degree of isolation at frequencies above 800 MHz and agree with the CAG that the broadcast receiving antennas connected to these switches can be expected to be less effective radiators above 800 MHz. In view of the expectation that cable systems generally will not use higher frequencies, there also does not appear to be a need to ensure that these switches provide significant isolation above the 800 MHz range. Accordingly, we are adopting a requirement that input selector switches used to alternate between cable service and an antenna provide 55 dB isolation between input ports over the frequency range 550 MHz up to and including 806 MHz.⁵⁶ We are also clarifying that isolation requirements for input selector switches used with cable service apply to all such switches, including stand-alone units.

122. *H. Attenuation of By-pass Switches and Other Devices.* In the Notice, we proposed to require that switches and other devices, such as filters that are intended to be used to bypass cable set-top devices or other equipment, not attenuate the input cable signals more than 6 dB at any output port. This proposal was intended to ensure that acceptable service is obtained when using supplemental equipment to improve compatibility between cable service and consumer equipment. The requirement would apply both to devices that are built into TV receivers and VCRs and to stand-alone bypass switches and filters.

123. The CAG and NYC support our proposal to establish a standard for attenuation at the output ports of bypass switches. CAG also suggests that we allow a slightly higher limit for attenuation of signals on frequencies above 550 MHz. It recommends that attenuation be limited to 6 dB in the frequency range 54-550 MHz, and 8 dB in the range 550-1002 MHz. The CAG states that higher losses should be permitted at higher frequencies because component losses, plus cabling and possibly switching losses, generally increase at the higher frequencies. SMCTC, however, believes that the amount of attenuation through input selector switches should be no greater than 1 dB.

124. We find our proposed 6 dB attenuation limit is appropriate and adequate to ensure acceptable service through bypass switches and filters from signals on frequencies at and below 550 MHz. We also believe a slightly higher limit is appropriate for signals on frequencies above 550 MHz for the reasons indicated by the CAG. The 1 dB standard suggested by SMCTC is unnecessarily stringent for switches and inappropriate for splitters. While 1 dB attenuation may be an achievable performance level for some switches, a less stringent 6 dB standard will provide a margin for variations in design and production and still ensure that satisfactory signal levels pass through switches. We observe that non-amplified signal splitters, by their design, divide the input signal strength among two or more output ports, so that the signal levels at individual output

ports generally will be substantially lower than the input signal. Accordingly, we will require that switches and other devices intended to be used to by-pass cable set-top devices (or the internal circuitry in such devices) and other equipment not attenuate input cable signals at any output port more than 6 dB for signals on frequencies at or below 550 MHz, or more than 8 dB for signals on frequencies above 550 MHz. These requirements will apply both to devices that are built into TV receivers and VCRs and to stand-alone units. We also wish to clarify that the limits that we adopt here do not apply to our procedure for the measurement of receiver noise figures, which allows 4 dB to be subtracted to allow for a signal splitter between the RF input connector of the receiver and the UHF tuner under test.

125. *Equipment Authorization.* In the Notice, we requested comment on whether we should subject "cable ready" television receivers and component descrambler/decoders to authorization under the notification or certification procedures, rather than the verification procedure to which these devices are currently subject.⁵⁷

126. In its comments, the CAG states that television receivers have very good levels of compliance under the Commission's verification procedure. It therefore believes there is no need for the Commission to impose new burdens on manufacturers or itself by applying either of the more rigorous notification or certification procedures to "cable ready" consumer TV equipment. The CAG argues that as the new rules become effective, any non-compliance is likely to be detected by rival consumer electronics manufacturers or by cable operators and brought to the attention of the Commission, which could then correct the violations. SMCTC and NYC urge the Commission to subject these devices to the certification process, where compliance is determined by the Commission before a grant of equipment authorization is made. SMCTC believes that a lesser procedure such as verification is too tempting for some manufacturers to resist taking short-cuts to obtain unfair competitive advantage over complying manufacturers. NYC believes that the verification procedure may be insufficient because the new standards for "cable ready" equipment will entail substantial improvements in the technical performance of TV equipment. NYC believes the close scrutiny of the certification procedure is needed to permit the Commission to monitor compliance.

127. We find that our verification procedure is sufficient to ensure that TV receivers, VCRs and similar consumer electronics equipment comply with our technical requirements, including the new "cable ready" standards. Our decision to subject this equipment to verification is influenced by the long standing record of compliance of television receivers under verification in the Commission's equipment authorization program. Moreover, we believe the requirements adopted herein do not involve any new or advanced technology which would challenge the current capability of the television receiver industry. In response to NYC's concern regarding the lack of compliance monitoring by the Commission under the verification procedure, we intend to closely monitor "cable ready" equipment for

⁵⁶ We are specifying the slightly higher 806 MHz upper limit to be consistent with the upper minimum tuning requirement for "cable ready" equipment decided above.

⁵⁷ The verification, notification and certification procedures are set forth in Section 2, Subpart J of the rules. See 47 C.F.R. §2, Subpart J.

compliance with the standards adopted herein through our sampling program provided for in Section 15.29(d) of the Rules.

128. *Implementation of Rules for New Consumer Equipment.* In the *Notice*, we proposed to require that all consumer electronics equipment manufactured or imported after December 31, 1996, that is marketed as "cable ready" or otherwise marketed as intended for connection directly to cable service comply with the new "cable ready" technical standards. This proposal was based on indications by the CAG and the JEC that they would complete their work on the new channel plan and the updated Decoder Interface standard by the end of 1993.

129. The CAG believes a slightly longer period is needed for implementation of the new equipment rules to ensure a smooth transition. First, it states that the "cable ready" equipment rules should be made effective in the spring season, when new products are generally introduced, rather than in the middle of the busy holiday season. Second, it submits that cable systems should be required to be in a position to provide component descrambler/decoders when Decoder Interface equipped receivers first become available, rather than after the deadline for all "cable ready" sets to incorporate Decoder Interface connectors. The CAG states that current information suggests that cable hardware suppliers may not be in a position to supply decoders in volume before the end of 1996. Based on these considerations, it suggests that the date for compliance with the "cable ready" standards be changed to June 30, 1997. It further recommends that cable operators be required to make decoders available to subscribers no later than December 31, 1996, six months before the deadline for inclusion of Decoder Interface connectors in "cable ready" consumer equipment.⁵⁸ The CAG also submits that although products that meet the "cable ready" requirements will not be immediately available, it recommends that the rule prohibit use of the term "cable ready" to describe equipment that does not meet these new standards become effective promptly. NYC similarly submits that until these standards become effective, we should prohibit manufacturers from using the term "cable ready" in connection with their products unless they disclose to consumers that some features of the equipment may not be operable when it is connected to a cable service. Most of the other commenting parties either did not address the implementation date for the new equipment or agreed with our proposed implementation schedule for new equipment.

130. We find that the schedule suggested by the CAG provides an acceptable plan for implementation of the new equipment rules. The relatively short additional time requested by the CAG will accommodate the normal introduction cycle of new consumer TV products and the production of component descrambler/decoders for distribution by cable operators with only a modest delay from our proposed schedule. This schedule will also allow additional time for completion of the Decoder Interface standard so that this feature can be incorporated into all new "cable ready" equipment. Accordingly, we will require that new TV receivers and VCRs marketed using the terms "cable ready" or "cable compatible" after June 30, 1997, comply with the "cable ready" equipment standards. We will consider the CAG's suggestion to require that cable

operators provide component descrambler/decoders to subscribers with "cable ready" equipment when we finalize the Decoder Interface standard.

131. We also agree with the CAG and NYC that the rule restricting use of the term "cable ready" to describe new consumer electronics equipment should be implemented promptly in order to minimize confusion for consumers. Accordingly, we are prohibiting use of "cable ready," "cable compatible," and other terms and descriptors that convey the impression a device is *fully* compatible with cable service, in the labeling and packaging of consumer TV receivers and VCRs manufactured or imported for sale to consumers in this country after October 31, 1994, unless that equipment complies with the "cable ready" technical standards.

Standards for Cable Systems

132. *Channelization.* We proposed to require that cable systems built or re-built after one year from the effective date of the new rules use the new EIA IS-132 cable channel plan for channels up to 1 GHz, consistent with our proposals for "cable ready" consumer equipment standards, and to require all cable systems to use this channel plan after 10 years. We also requested comment on how our adoption of the EIA IS-132 channel plan would affect the use of compression methods or multiplexing of cable channels.

133. The commenting parties generally support our proposal to require cable systems to use the EIA IS-132 channel plan. For example, the CAG agrees that this requirement is needed to ensure compatibility with the tuners of consumer electronics equipment. Greater Media and the Joint Cable Commenters submit that cable systems should be allowed to use other channel schemes for transmitting digital and other non-standard signals. The CAG submits that compliance with the EIA IS-132 channel plan is likely to present minimal difficulties for most cable systems and therefore believes that it would be reasonable to implement this standard on a more expedited timetable than that proposed. It recommends that the compliance date for all cable systems be established as June 30, 1997, the same date it proposes for making effective the technical standards for "cable ready" consumer equipment. The CAG further believes that we should provide for accommodating cable operators that are not able to meet this deadline.

134. To complete our adoption of the EIA IS-132 cable channel plan, we are requiring all cable systems to use this plan for transmitting analog television service. We wish to clarify that cable systems will not have to activate channels for all of the channels specified in EIA IS-132, but rather will be required to adhere to the frequency plan in this standard for the analog channels that they provide to their subscribers. While cable systems may use other channel plans for providing digital service, we advise cable operators that, consistent with our plan to adopt cable digital transmission standards as indicated below, we intend to adopt a channel plan for digital cable service at an appropriate time in the future.

135. We are also adopting the proposed transition plan recommended by the CAG for requiring cable systems to implement this new standard. As the portion of EIA IS-132

⁵⁸ We are deferring this issue to our subsequent action on the

Decoder Interface standard.

that addresses frequencies under 1 GHz has been substantially defined for some time and is already used by most cable systems so that hardware is available, we believe one year is an adequate amount of time for new and re-built cable systems to comply with that standard. We similarly find that it would not be unduly burdensome to require that all cable systems comply with the EIA IS-132 channel plan by June 30, 1997. As the CAG notes, this would ensure that all cable systems are using the channel plan standard when the "cable ready" equipment standards become effective. Accordingly, cable systems built or re-built after May 31, 1995 will be required to comply with the new cable channel standard, and all cable systems must comply with this standard by June 30, 1997.

Future Technologies

136. In the *Notice*, we indicated that in order to avoid future compatibility problems that could arise with the introduction of digital transmission methods by the cable industry, it will be necessary to standardize the system used for digital transmissions. We noted that the CAG has stated that it would be feasible to establish standards for digital compression/decompression and a standard security interface system on a schedule that takes place over the next several years.⁵⁹ We recognized that developmental work in this area is still in progress, and therefore requested suggestions for a regulatory plan that would require completion of a digital cable transmission standard in a manner that would allow for timely and efficient introduction of consumer products that could receive service under the new standard.

137. A number of parties agree that we should establish standards for transmission of digital signals on cable systems. The CAG states that a firm understanding that digital standards will be prescribed is important to the current cooperative efforts of the cable and consumer electronics industries and to assure consumers and legislators that the kinds of problems that led to enactment of Section 17 do not occur. The CAG further states that it plans to finish its work on defining digital transmission and tuner specifications by the end of 1994. It indicates that the JEC is investigating on-going digital standards activities both domestically and internationally and will provide a report on this work in mid-1994 that could serve as the basis for a further rule making action by the Commission.⁶⁰ Pacific Bell believes the CAG's schedule for developing a cable digital standard is overly ambitious and does not allow time for proper completion of work in a number of complex areas, including technical and market testing. It expresses

concern that any standards developed prematurely could face consumer rejection or technical obsolescence. Pacific Bell believes that a more reasonable estimate for completing a digital cable standard is late 1995.

138. Consistent with their position on standards for the Decoder Interface connector and associated component descrambler/decoders, Circuit City, Mitsubishi and News Datacom submit that to provide for a competitive market in hardware and software functions, we should: 1) establish a standard for digital cable transmissions, including security; 2) only allow functions directly related to security to be reserved to hardware/software provided by cable operators; and, 3) require that other functions be accommodated in a manner that would allow them to be provided on a competitive basis. News Datacom, Pacific Bell and SMCTC submit that we should begin to develop standards for cable digital transmission now, to avoid new compatibility problems in the future. Titan similarly requests that we initiate an inquiry into the standardization of digital 525-line television service. News Datacom further recommends that the cable digital standard be compatible with MPEG-2. The Joint Cable Commenters note that the EIA IS-132 channel plan does not define the multiplexing of digitally compressed channels within a 6 MHz channel and submit that the appropriate time to further define the channel plan in this regard would be at the time digital transmission standards are set.

139. GI and the Joint Cable Commenters oppose standardization of cable system security technology or rules that would allow the incorporation of security circuitry into consumer equipment. GI argues that such an approach would give "pirates" a single technical design to attack and thereby undermine the ability of cable operators to protect their signals. Hewlett-Packard and Titan, however, recommend that we also establish a standard security system for cable digital service. They indicate that modern encryption/security methods make it feasible to achieve adequate security in a digital system that separates the signal coding (program information) and access control (security) functions by using standard interfaces and that such an approach would not be less secure than current approaches. Titan states that this approach would allow both the decoder and access control functions to be incorporated into consumer equipment and that access control could be provided through a secure chip within a "smart card." They urge that we proceed expeditiously toward adoption of a standard security system for component descrambler/decoders.

⁵⁹ The CAG indicates that standards for the digital cable environment could be established in accordance with the following timetable:

1993: Define "cable ready"

1994: Define transmission and tuner specifications

No later than 1995: Set target dates for standards for decompression and a standard security interface system.

See "Supplemental Comments of the Cable-Consumer Electronics Compatibility Advisory Group," ET Docket No. 93-7, filed with the Commission July 21, 1993.

⁶⁰ The CAG indicates that its work will attempt to balance the need for early identification of proposed standards with the importance of preserving necessary flexibility to permit technological innovation and the development of new services and

consumer electronics features. The CAG submits that its work does not intend to foreclose the development of new technology, including new scrambling systems, or the development and delivery of new services such as on-line data services, video games, video telephony, digital music and others. The CAG also states that such services should not be precluded by strict enforcement of the new channelization plan. It indicates that the new Decoder Interface connector is being designed in a fashion which should be able to accommodate new scrambling methodologies and other new services. It further submits that the cable and consumer electronics industries envision establishing procedures whereby new services and scrambling methodologies can be tested for compatibility with the Decoder Interface.

140. Mitsubishi and Titan believe that we should link a standard for cable digital transmissions to the standard for broadcast advanced television (ATV) service. They state that conforming digital standards for broadcast and cable television will avoid the investment of billions of dollars in incompatible systems and provide clear guidance for industry. The Interactive Multimedia Association (IMA) believes that we should also, in the near term and synchronous with the development of digital cable standards, define a return data path from consumer electronics devices to cable service. It states that such a return path is needed to allow the implementation of new interactive multimedia services. The IMA submits that the return path should be compatible with the new Decoder Interface standard and should include a definition of a standard bi-directional protocol for connecting interactive services to consumer equipment.

141. GI, TCI and Home Box Office (HBO) urge that we refrain from proceeding to adopt a digital transmission standard for cable systems now. They state that while digital transmission standards may be useful eventually, the dynamic nature of these emerging technologies could lead to inefficient outcomes if we were to adopt such standards too soon. HBO believes that whatever standard may prove necessary for digital cable transmission will be developed most efficiently through market evolution. TCI states that we should rely on industry groups to develop and recommend cable digital standards. HBO also states that any standards setting action by the Commission now would lead to a halt in the existing transition to digital systems by satellite cable services.

142. AT&T, Bell Atlantic and USTA also argue that we should provide for consideration of all types of video transport services in setting digital transmission, compression and interface standards. AT&T recommends that we initiate a broad ranging inquiry to address interfaces among equipment in the home and to transmission and information processing standards for future digital multimedia products and standards.

143. We recognize the need to proceed with caution in this area and to ensure that our processes and regulations do not unnecessarily impair the development of new cable technologies and services and of appropriate interfaces between such technologies and services with other media. Notwithstanding these considerations, we find that standards for cable digital transmissions are necessary to avoid future compatibility problems when cable systems use digital transmission methods, and to allow the mass production of economical consumer equipment that is compatible with cable digital services. In the latter regard, we believe that standardization is needed to ensure the establishment and effective operation of a competitive market in consumer hardware and software products for connection to digital cable service.

144. As observed by a number of the commenting parties, the development of cable digital standards will have to address a number of important and complex technical and policy issues in addition to the question of compatibility between cable systems and consumer electronics equipment. Some of these include the appropriate compression and signalling technologies, our policy towards encryption methods, the relationship of the cable digital system to the terrestrial broadcast ATV standard and multimedia, whether to require all new and innovative services to adhere to the standards, and the interfaces between cable digital technology and the technologies used to deliver service by

alternative media such as video dialtone and direct satellite broadcasting. In view of the broad scope of the issues involved in defining cable digital transmission standards and related policies, we believe it is more appropriate to defer these matters to a separate proceeding. Accordingly, we will not take any further steps toward adoption of cable digital standards in this proceeding. We will address these and other issues relating to digital video technologies and services in a future Notice of Inquiry that will initiate an omnibus proceeding on digital video services.

PROCEDURAL MATTERS

145. Pursuant to Section 603 of the Regulatory Flexibility Act, 5 U.S.C. Section 601, *et seq.*, the Commission incorporated an initial regulatory flexibility analysis (IRFA) in the *Notice of Proposed Rule Making* in this proceeding. Written comments were requested on the IRFA. Our final regulatory analysis is as follows:

I. *Need for and Objective of the Rules:* Section 17 of the Cable Television Consumer Protection and Competition Act of 1992 requires the Commission to prescribe regulations for assuring compatibility between TV receivers and VCRs and cable systems, consistent with the need to prevent theft of cable service. We believe that the rules we are adopting will ensure compatibility between cable systems and consumer equipment while imposing the least burden on equipment manufacturers, cable systems and consumers.

III. *Any Significant Alternatives Minimizing the Impact on Small Entities and Consistent with Stated Objectives.* Wherever possible, we have attempted to minimize costs for both cable operators and consumer electronics manufacturers. The regulatory burdens we are adopting are necessary to ensure that the public receives the benefits of compatibility between cable systems and their TV receivers and VCRs. The major area where alternatives are possible is in the choice of the Decoder Interface connector as a means for avoiding the need to use set-top devices. Use of a Decoder Interface will resolve the need for set-top devices and also provide a path to compatibility with future services that use digital compression. While the Decoder Interface connector will be a new requirement for manufacturers, the cost of this feature is expected to be recoverable through a modest premium in the prices of "cable ready" TV receivers and VCRs. The amount of this increase is likely to be less for cable subscribers than the cost of technologies that would provide subscribers all authorized signals "in the clear." We will continue to examine alternatives in the future, particularly with regard to the technical standard for the Decoder Interface standard, with the objective of minimizing any significant impact of our regulations on small entities.

146. The Commission's Secretary will send a copy of this First Report and Order to the Chief Counsel for Advocacy of the Small Business Administration.

147. Accordingly, IT IS ORDERED that Parts 15 and 76 of the Commission's rules ARE AMENDED as set forth in Appendix A, effective 30 days after the publication of a summary of this First Report and Order in the Federal Register. This action is taken pursuant to authority provided in Sections 4(i), 7(a), 302, 303(c), 303(f), 303(g), 303(r) and 324A of the Communications Act of 1934, as amended 47 U.S.C. Sections 154(i), 157(a), 302, 303(c), 303(f), 303(g), 303(r) and 324A.